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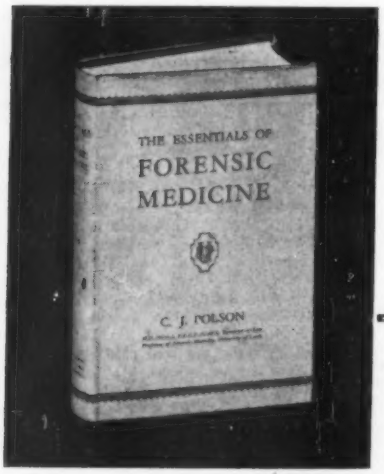

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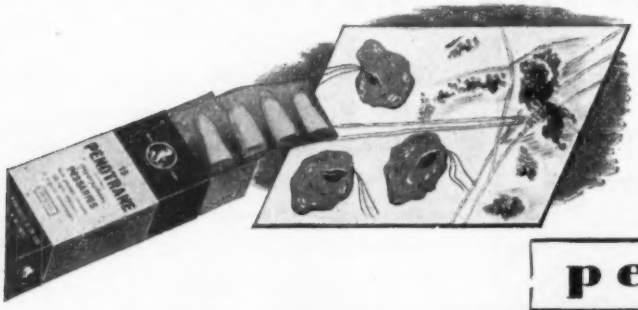

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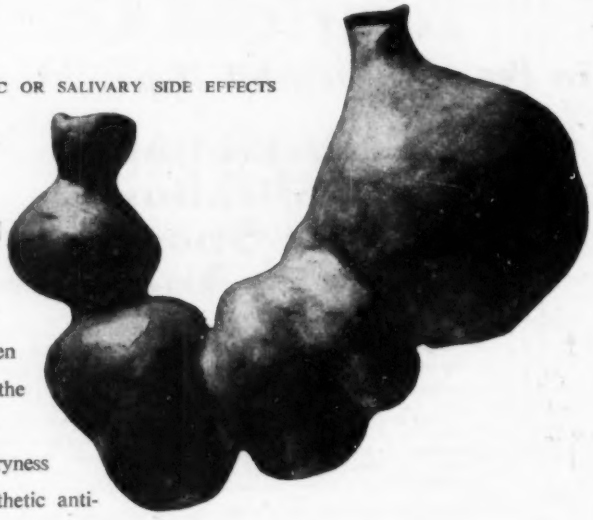

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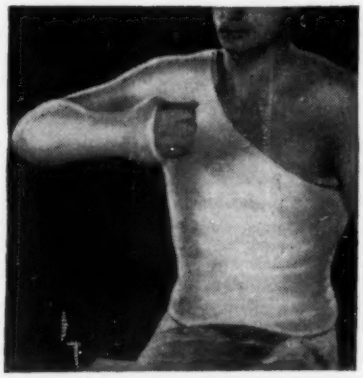

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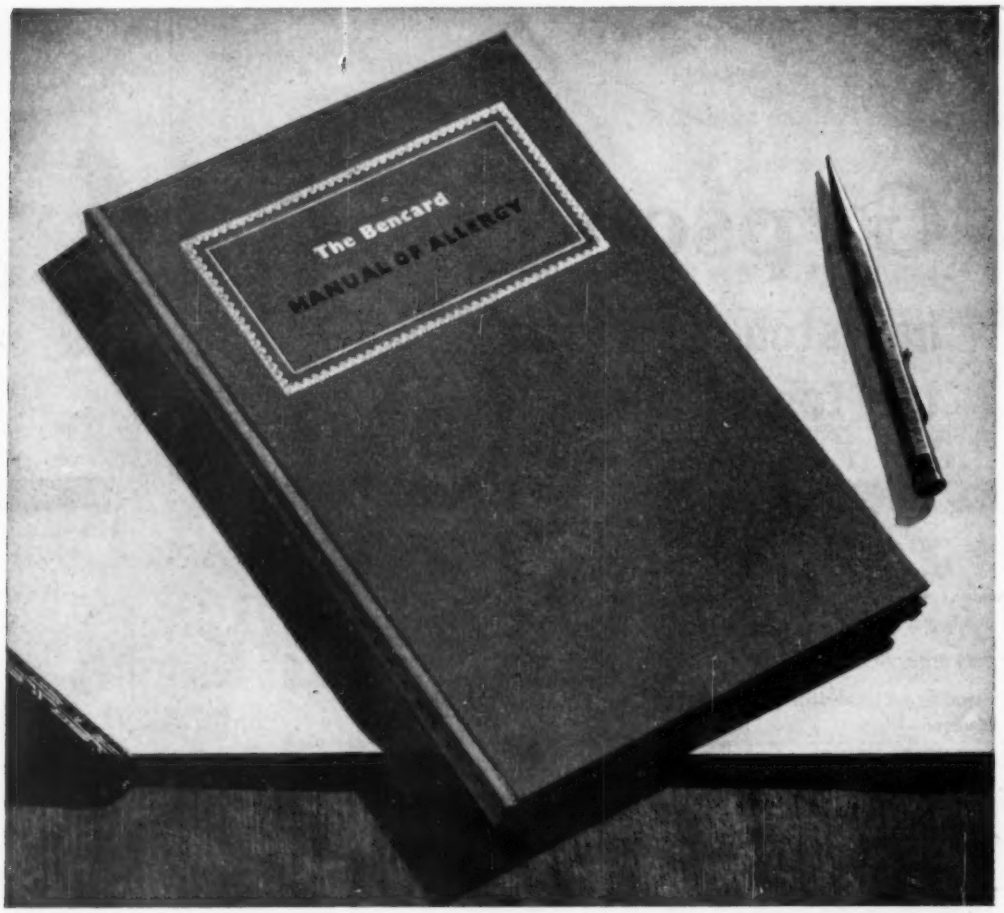

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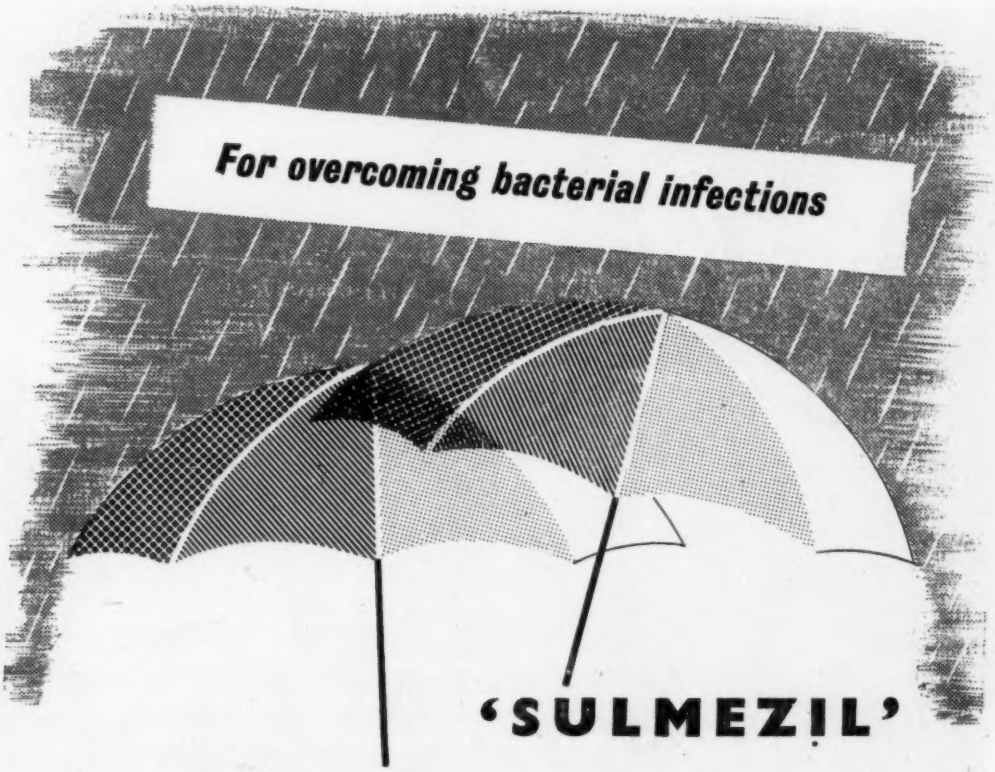

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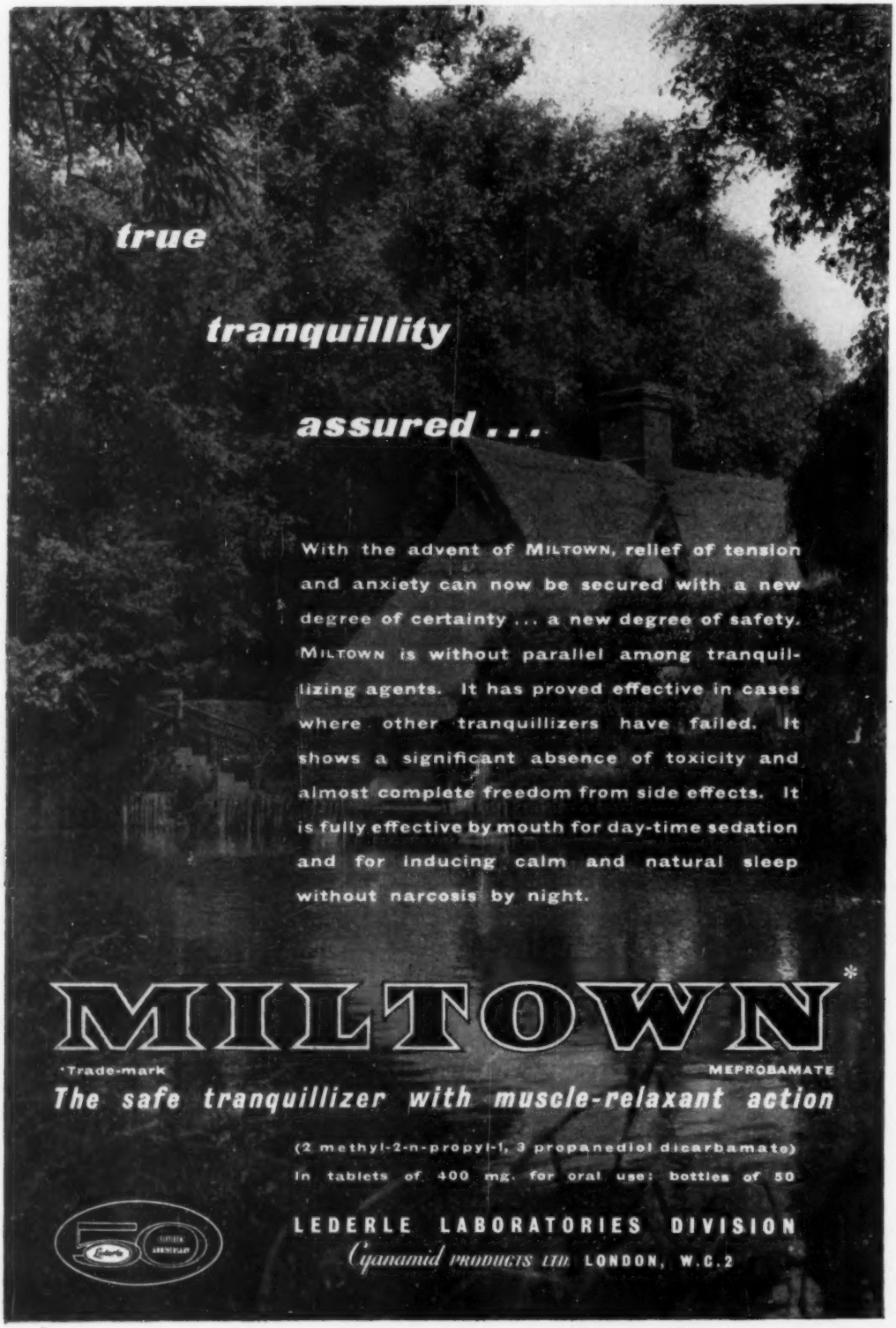
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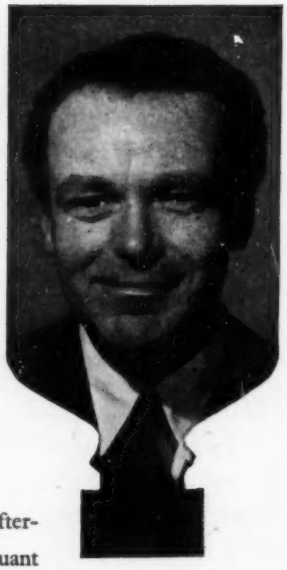

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Pyridoxine HCl (B_6)	0.34 mg.
Folic Acid	0.34 mg.
Vitamin B_{12}	0.34 mcgm.
Ascorbic Acid (C)	20 mg.
Methylcellulose	200 mg.
Iron ($FeSO_4$ exsicc.)	3.34 mg.
Calcium ($CaHPO_4$)	140 mg.
Phosphorus ($CaHPO_4$)	108 mg.
Iodine (KI)	0.5 mg.
Fluorine (CaF_2)	0.1 mg.
Copper (CuO)	1 mg.
Potassium (K_2SO_4)	5 mg.
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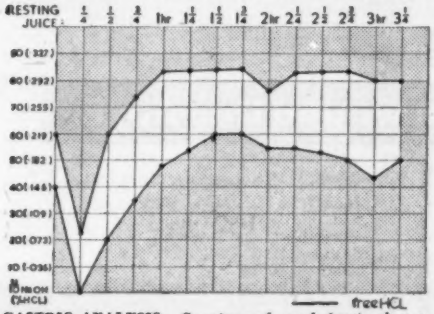
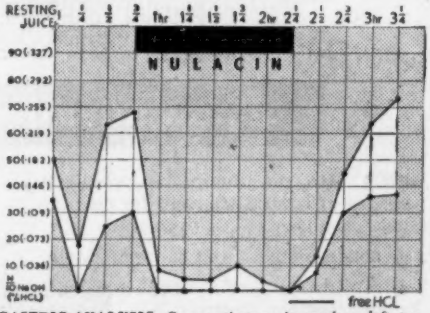


GASTRIC ANALYSIS. *Superimposed gruel fractional test-meal curves of five cases of duodenal ulcer.*



GASTRIC ANALYSIS. *Same patients as in graph on left, two days later, showing the striking neutralizing effect of sucking Nulacin tablets (3 an hour). Note the return of acidity when Nulacin is discontinued.*

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The Control of Gastric Acidity. *Brit. Med. J.* 26th July, 1952, **2**: 180-182. Medical Treatment of Peptic Ulcer. *Med Press* 27th February, 1952, **227**: 195-199. Notes on Remedial Agents. *Med Rev.* September, 1952, **46**: 162. Discussion on Peptic Ulceration. *Proc. Roy. Soc. Med.* May 1953, **46**: 354. The Effect on Gastric Acidity of "Nulacin" tablets. *Med. J. Aust.* 28th November, 1953, **2**: 823-824. Control of Gastric Acidity by a New Way of Antacid Administration. *J. Lab. Clin. Med.* 1953. **42**: 955. Further Studies on the Reduction of Gastric Acidity. *Brit. Med. J.* 23rd January, 1954, **1**: 183-184. Clinical Investigation into the Action of Antacids. *The Practitioner* July, 1954, **173**: 46. Management of Peptic Ulceration in General Practice. *Med. World* December, 1954, **81**: 591-601. Ambulatory continuous Drip Method in the Treatment of Peptic Ulcer. *Amer. J. Dig. Dis.* March, 1955, **22**: 67-71. Notes on Remedial Agents. *Med. Rev.* October, 1955, **49**: 142. Antacids in Peptic Ulcer. *The Practitioner*, January, 1956, **176**: 103.

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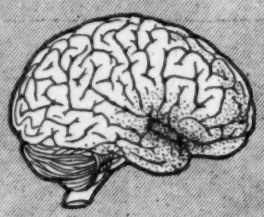

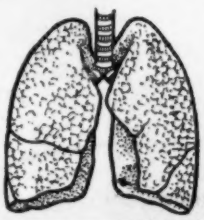

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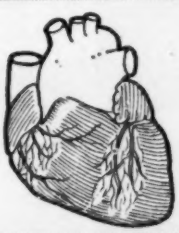

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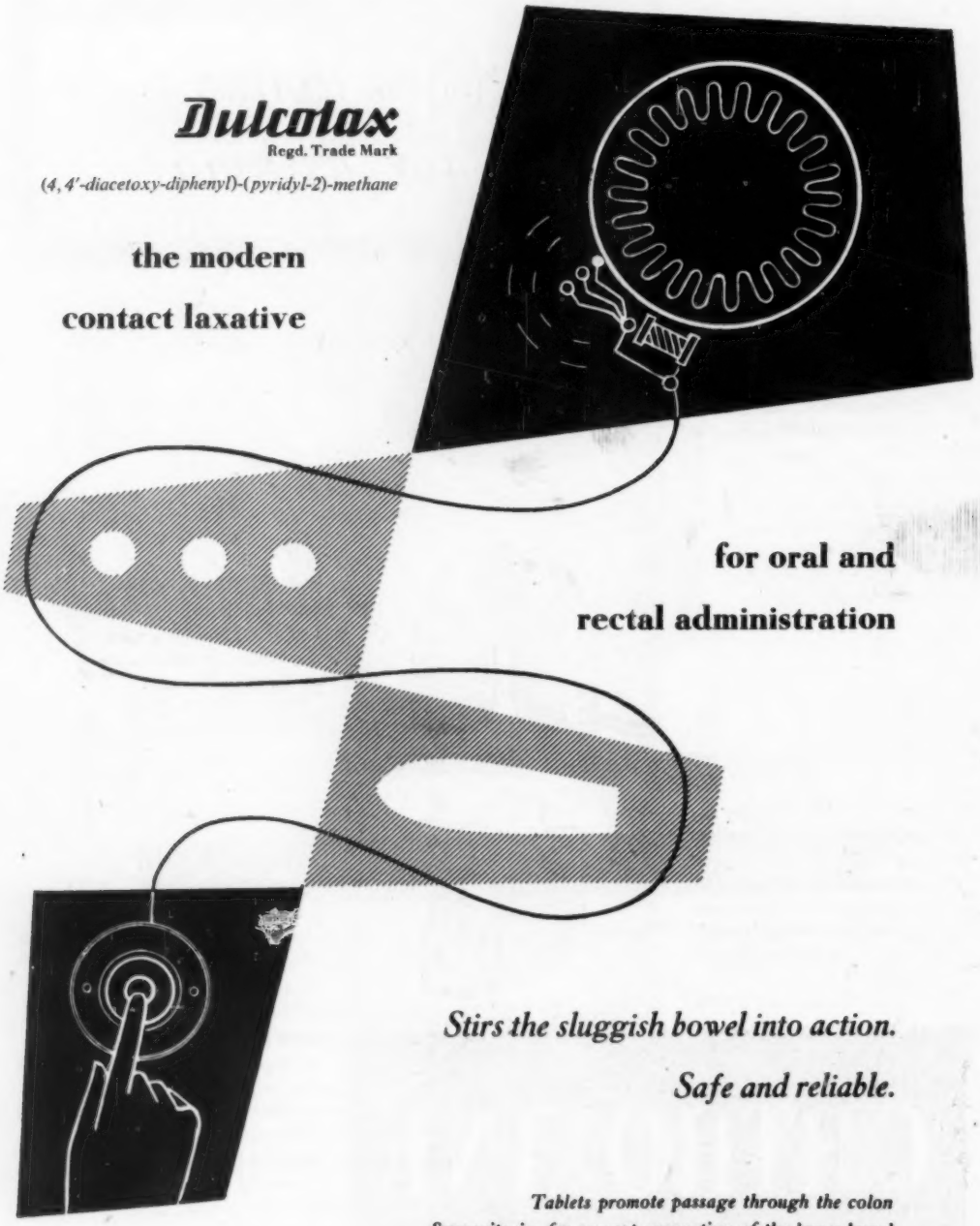

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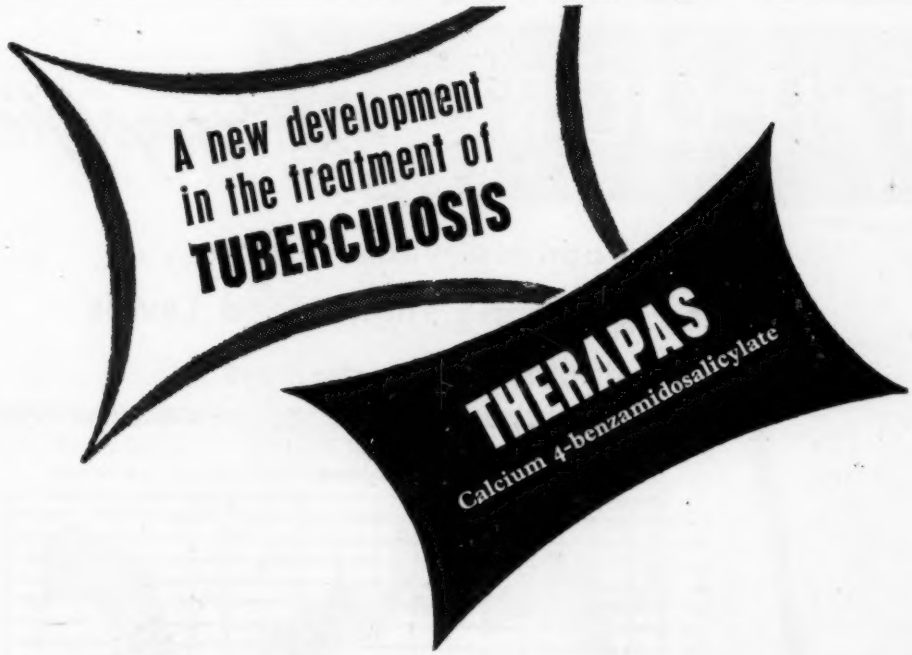

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(1) *J. Pharmacy & Pharmacol.*, 1953, **5**, 849.

(2) *Schweiz. Med. Wschr.*, 1955, **85**, 222.

(3) *Brit. Med. J.*, 1953, **1**, 95.

(4) *Brit. Med. J.*, 1953, **1**, 901.

(5) *Lancet*, 1955, **1**, 116.

(6) *Tubercle* 1955, **36**, 209.

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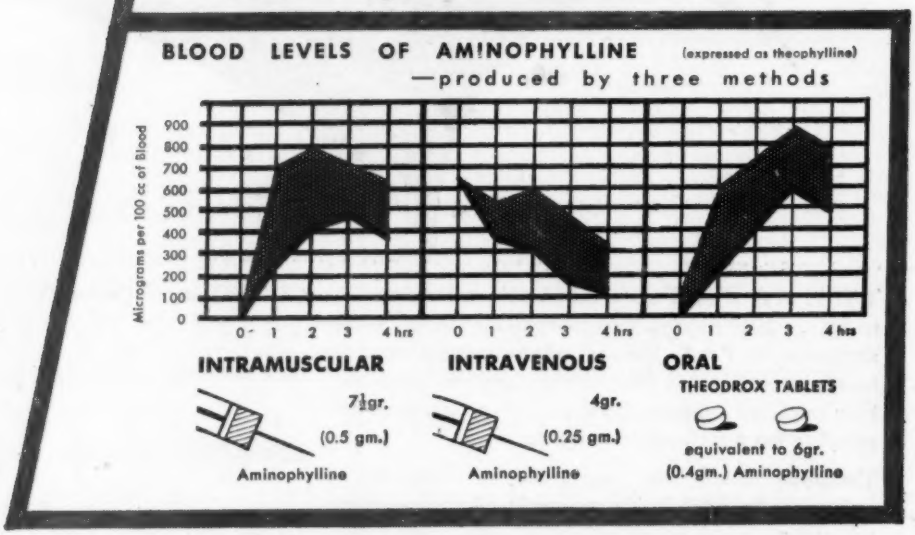

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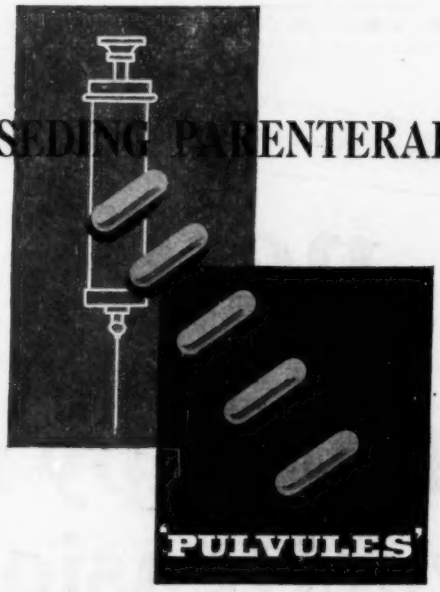

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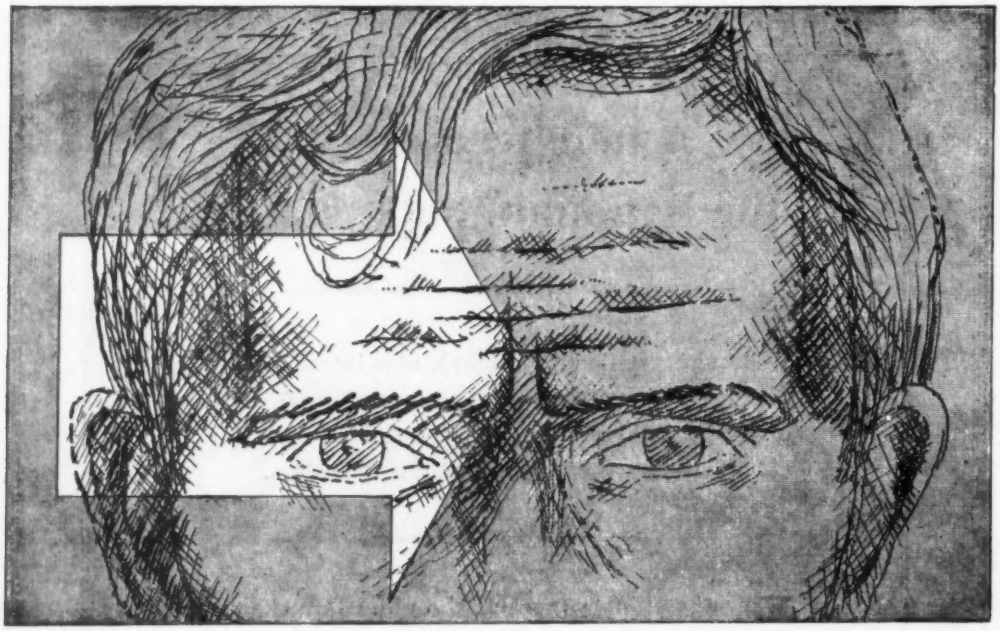

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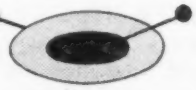

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THROMBOSIS OF THE SIGMOID SINUS
PAST AND PRESENT

PHILIP V. READING
M.S. Lond., F.R.C.S.
SURGEON, EAR AND THROAT DEPARTMENT, GUY'S HOSPITAL, LONDON

PETER H. SCHURR
M.A., M.B. Camb., F.R.C.S.
NEUROSURGEON, GUY'S-MAUDSLEY NEUROSURGICAL UNIT, LONDON

THIS century has seen a decline in the incidence and virulence of many diseases as a result partly of man's ingenuity and partly of processes beyond the range of his understanding or control. Many senior physicians are convinced that, long before the introduction of the sulphonamides, there had been a progressive lessening of the virulence of the hæmolytic streptococcus; scarlatina, for instance, is no longer the same disease as was so dreaded forty years ago. One presumes that the credit is due to preventive medicine and the improvements in hygiene resulting from the obscure labours of public-health officials; certainly the surgeon has had little share in effecting this beneficial change.

With the advent of penicillin has come victory over the streptococcus so complete that the "acute ear" occupies now only a small part of the otologist's day, and this decline in the frequency of acute suppurative otitis has brought in its train a welcome reduction in the number of intracranial complications. This paper is an attempt to illustrate and discuss the changes in behaviour and frequency of one complication, thrombosis of the sigmoid sinus, and the changes in its treatment and prognosis brought about by the widespread use of antibiotic therapy.

The case-reports on which this paper is founded are drawn from a surgical and otological experience extending back from these days of antibiotic abundance, through the sulphonamide era, to those earlier times when, relatively unaided by the pharmaceutical laboratories, one was confronted with a streptococcus still virulent though—one was assured by one's seniors—only the degenerate enfeebled descendant of doughty ancestors.

Changes in Frequency

So many factors influence the quantity of clinical material reaching the individual surgeon—the dislocations of war and fluctuations in number and economic level of the surrounding population, to name only two—that his experience of any particular disease is no indication of its general frequency throughout the country.

In the personal series of one of us (P. V. R.) of cases of sigmoid-sinus thrombosis two groups were studied: 50 in 1937–45, a period when sulphonamides were the only standby; and 21 in 1946–54, the penicillin era.

Hubert's (1941) paper is of interest here. In the first group which he analysed, those treated in 1929–36, immediately before the widespread use of sulphonamides, he saw an average annual intake of 623 patients with acute mastoiditis, including 95 with sigmoid-sinus thrombosis (1·9%). The second group was in the period 1937–40, during the régime of the sulphonamides, and he found that the average annual number of patients with acute mastoiditis was 463·5 and the number of thromboses 24 (1·2%).

In an attempt to carry this comparison of Hubert's into the penicillin era we have analysed two sets of figures in our own practice. In 1943 and 1944, when sulphonamides alone were available, 360 cortical mastoidectomies were done and 14 cases of sigmoid-sinus thrombosis were encountered; in 1953 and 1954, under the influence of the general and widespread use of penicillin, only 28 cortical mastoidectomies were required, and only 2 clinical cases of sigmoid-sinus disease were recorded, though 2 other patients developed cortical thrombophlebitis and petrosal-sinus thrombosis as a complication of their otitis.

Relative Changes in Ætiology

The causes of thrombosis of intracranial venous sinuses in our cases were as follows:

Years	*Chronic mastoiditis*	*Acute mastoiditis*
1937–45	13	27
1946–54	11	10

The pathology of chronic mastoiditis (epitympanitis) is a progressive structural change brought about by the unrelenting insidious erosions of cholesteatoma in an acellular temporal bone; and it is affected only temporarily by the administration of antibiotics. The country-wide apathetic attitude to the "chronic running ear" among large numbers of the population does not encourage the hope that this disease will cease to be responsible for this complication.

Thrombosis arising from primary acute infection of the mastoid in a fully pneumatised bone shows, on the other hand, a sharp decline which, considered in relation to the decrease in the number of cortical mastoidectomies required, must be attributed to the use of antibiotic therapy.

Changes in Pathology and Manifestations

The clinical course of sigmoid-sinus thrombosis is determined by the fate awaiting the thrombus within the sinus: absorption and recanalisation; disintegration and pyæmia; or retrograde extension of the clot further into the venous channels of the dura mater. Each of these possibilities will be considered separately, though they usually occur simultaneously, with one or another predominating in the clinical picture. A cerebral abscess may develop in relation to sinus thrombosis, or thrombophlebitis in relation to a cerebral abscess, but these events are not discussed here, because they are not germane to the present subject.

Absorption and Recanalisation of Thrombus

The accidental finding of an unsuspected abscess round the sinus during mastoidectomy, common enough in the days of bacterial luxuriance unchecked by chemotherapy, has never been considered to indicate a surgical attack on the lumen of the sinus or on the internal jugular vein in the neck. Surgical experience also indicated that a clot within the lumen of the sinus need not be removed, provided that it was not disintegrating into septic emboli. Thrombosis is recognised as a defence of the body against bacterial invasion and, even before the days of chemotherapy, sometimes proved completely effective. In 1936 a patient was found at mastoidectomy to have the place of his sigmoid sinus taken by a contracted fibrous cord; he had not previously had rigors or headache but had sought relief only from a persistent foul otorrhœa. This relatively aseptic thrombosis and fibrosis had taken place without any exposure to sulphonamide.

Disintegration of Thrombus and Pyæmia

Pitt (1890) analysed the necropsy findings in 57 patients who had died of suppurative disease of the ear at Guy's Hospital in twenty years. Sigmoid-sinus thrombosis was present in 22, and 70% of these had died from pyæmia. What effect has the use of chemotherapy and antibiotics had on the incidence of pyæmia? A study of the personal records of one of us (P. V. R.) shows that, in the eight years before 1945, rigors and high pyrexia were a predominating feature of sigmoid-sinus thrombosis in 29 of 50 patients—a finding in agreement with that of Rosenwasser (1945)—and in the eight years since that date, when penicillin was freely in use, in 4 of 21 patients with sigmoid-sinus thrombosis. It can be seen from our

figures that rigors are no longer so characteristic a feature, and the clinical picture of sigmoid-sinus thrombosis has thus been materially altered.

In the past, septicæmia and, later, meningitis dominated the clinical picture and obscured the manifestations of other pathological processes which might be taking place within the skull, and only on the subsidence of the septicæmia did they become manifest. This applies particularly to the third possible fate of the thrombus, which is now to be discussed.

Progressive Extension of Thrombus into Other Venous Channels

Pitt's (1890) analysis of necropsy findings showed that the thrombus had extended into the internal jugular vein in 11 of the 57 patients and into other intracranial sinuses in 9. We have remarked, in the few cases presenting in recent years, that an unusually high proportion exhibits a tender swelling along the course of the internal jugular vein in the upper part of the neck, quite early in the course of the disease.

Extension to other intracranial venous sinuses was in the past often obscured by the more dramatic symptoms produced by the infective element of the disease, septicæmia or meningitis, and was noted usually only as a sequel to an otherwise successful operation. The disease may now present firstly as a relatively trivial otitis, rapidly overcome by the general practitioner with the help of antibiotic therapy; and the subsequent aseptic intracranial thrombosis sets a problem to be solved by the neurologist, the aural surgeon being by-passed as having nothing to contribute.

Suppression of the infective element in sigmoid-sinus thrombosis has thrown into prominence some of the signs of spread to other intracranial sinuses, which are perhaps less easily recognised by otologists than the more florid septicæmic disease, and it is proposed to consider them in detail. Tribute must here be paid to Symonds, who as early as 1931 had recognised these extensions and whose subsequent writings have done so much to elucidate their diagnostic and therapeutic problems.

Lateral-sinus thrombosis.—The effect of occlusion of the lateral (transverse) sinus depends to some extent on the anatomical arrangement of the torcula. The superior sagittal sinus usually drains mainly into the right lateral sinus; and, when the alternative passage to the other side is small or non-existent, occlusion of the lateral sinus will raise the intracranial pressure. This variation in drainage explains to some extent the incomplete reliability of the Tobey-Ayer test (1925) for patency of the lateral sinus, because if the jugular vein is compressed on the side not chiefly draining the superior sagittal and straight sinuses, the intracranial pressure will not be raised, even if the opposite lateral sinus is occluded. Usually the inferior anastomotic vein of Labbé joins the lateral sinus at the origin of the sigmoid sinus, and the lateral occipital veins enter its middle third. When thrombosis is confined to the sigmoid sinus, these veins can continue to drain to the other side; but, when the lateral sinus is occluded, they provide a route for extension of the thrombus to cortical vessels.

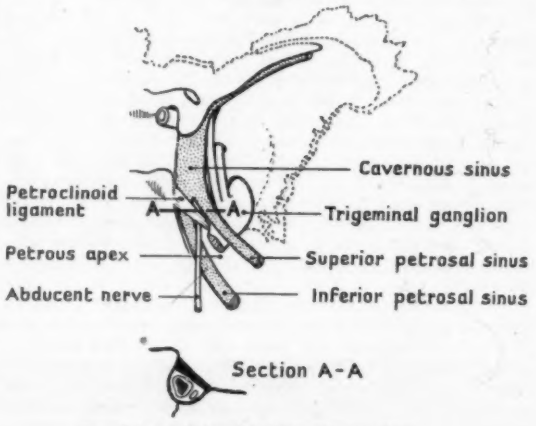
Jugular-vein thrombosis.—Extension of thrombosis from the sigmoid sinus to the internal jugular vein may give rise to a tender swelling in the neck, and, as Symonds (1952) has mentioned, thrombosis of the jugular bulb may, rarely, give rise to pressure on the ninth, tenth, and eleventh nerves in the jugular foramen, causing paralysis.

Superior-sagittal-sinus thrombosis.—Thrombosis of the posterior half of the superior sagittal sinus raises the intracranial pressure, causing the familiar features of headache, vomiting, and papilloedema without any focal signs. Thrombosis of the superior-sagittal sinus may occur by direct spread from a lateral sinus, but not infrequently the picture of raised intracranial pressure without localising signs is seen after otitis media and without demonstrable occlusion of the sagittal sinus. This picture, with or without sinus thrombosis, has been called otitic hydrocephalus by Symonds (1931, 1956).

Cortical venous thrombosis.—Should thrombosis spread to the tributaries of the dural sinuses, then focal epilepsy, hemiplegia, and other neurological signs of cortical thrombosis will appear. Cortical thromboses tend to produce dramatic and episodic symptoms; the signs are often widespread and may affect all the functions of one hemisphere, or occasionally the thrombus may invade sinuses or veins on the side opposite the otitis.

Inferior- and superior-petrosal-sinus thrombosis.—The inferior petrosal sinus forms an easy route for continuation of sigmoid-sinus thrombosis, and provides the means by which the thrombus may spread to the cavernous sinus or to the opposite side. The association of otitis media with homolateral abducent palsy and pain in the corresponding half of the head is recognised as Gradenigo's syndrome (Gradenigo 1904). Otologists regarded the syndrome as indicating suppurative osteitis at the tip of the petrous bone, the infection having been conveyed thither by air-cells in the body of the bone. This concept has now been modified, largely owing to the influence of the teaching of Symonds and of Garcin and Pestel (1949). True apical petrositis is considered to be extremely rare, and the surgical techniques of exenteration of air-cells (Eagleton 1931), and the elaborate operations of Kopetzky and Almour (1930) are seldom called for. One of us (Reading 1944, 1946) has shown that this condition can be cured by the use of antibiotics alone without operation on the petrosal apex. The inferior petrosal sinus and the abducent nerve both leave the posterior fossa in the same dural envelope, known as Dorello's canal, in which the nerve may be compressed (Sears 1926) (see figure). Distension of the sinus by a firm mass of clot and swelling of adjacent tissues may produce paralysis of the ipsilateral external rectus muscle of abrupt onset and transitory course (Symonds 1944). Most cases of Gradenigo's syndrome are due to inferior-petrosal-sinus thrombosis with an area of adjacent meningitis. The retro-orbital pain and the pain in the distribution of the ophthalmic division of the trigeminal nerve, which may occur, are attributed to irritation of the sensory root or the ganglion by thrombosis in the adjacent superior petrosal sinus (Symonds 1952) (see figure).

Cavernous-sinus thrombosis.—We have records of one young woman who developed bilateral proptosis, chemosis, and ophthalmoplegia after removal of an infected thrombus from the sigmoid sinus. Necropsy confirmed that the petrosal sinuses had been the channels along which the thrombus had spread to the cavernous sinus.



Dorello's canal (modified from Frazer 1948).

Changes in Treatment

Has the introduction of penicillin swept away the necessity of operating on the mastoid when sigmoid-sinus thrombosis is present?

The consensus of opinion of recent writers is that mastoidectomy and exposure of the sinus are still urgently needed:

"Bacteræmia due to thrombophlebitis of the lateral sinus will or may persist despite chemotherapy (sulphonamides) and surgical measures for the eradication of the phlebitic process are warranted." This is the conclusion of Rosenwasser (1945) after his study of 100 patients.

Hadfield and Hinde (1949) state: "Where doubt exists about the established presence of lateral sinus thrombosis, it would be wise to assume its presence . . . chemotherapy and biotherapy are an adjunct and not an alternative to surgical measures."

Similarly Smith (1950) says: "The persistence of active concealed infection, even if of low grade, should compel operative exploration, and the cardinal sign of this state is elevation of the temperature even though of slight degree." And again, after commenting on the disappearance of rigors under antibiotic therapy: "... the best guide to the necessity of operation is the temperature chart."

The following case-report illustrates this point:

A man, aged 35, was admitted in 1946 to an outlying suburban hospital, where the otological duties mainly devolved on the general surgeon. The patient had had a foul otorrhœa for many years, and his admission was caused by increase of discharge and by the appearance of severe pain over the mastoid and the side of the head. For eight days he was treated by the surgeon on duty by four-hourly injections of 250,000 units of penicillin. During this period he developed a swelling of the upper part of the neck and complained of one or two minor chilly sensations. An aural surgeon was called in at the end of the eight days and performed immediate mastoidectomy, finding a large cholesteatoma which had destroyed a considerable part of the outer wall of the sinus. Pus and a mass of clot were evacuated from the interior of the sinus; the internal jugular vein was tied and divided. Shortly after the operation the patient collapsed and died. Necropsy showed clot throughout the entire length of the internal jugular vein, clot in the right auricle, pyæmic infarcts throughout the lungs, and the signs of a profound general septicæmia in other parts of the body.

As shown by Smith (1950) and by our own figures, acute mastoiditis is rapidly dwindling in importance as a cause of sigmoid-sinus thrombosis; such cases of the disease as still appear are due mainly to chronic mastoiditis, a condition unlikely to respond rapidly and completely to any antibiotic therapy. This proved true of the patient recorded above, and his tragedy is likely to be repeated, so long as acute exacerbations of chronic mastoiditis are mistaken for primary acute mastoiditis, and so long as the true significance of persistent pyrexia is not appreciated. There is a tendency to overrate the efficacy of antibiotic and chemotherapy or to belittle the power of the disease, particularly among those who have never seen it untreated by these methods.

Have antibiotics done away with the need for incising the thrombosed sinus and for tying the internal jugular vein?

Pitt (1890) found that 70% of the deaths in his series were due to pyæmia, and he advocated that the internal jugular vein should be tied to prevent further dissemination, and that the sigmoid sinus should be incised to allow removal of the infected clot.

Lane must be given the credit of establishing this operation as logical and feasible (Lane 1893), and up to the advent of penicillin it was widely practised. The persistence of pyrexia and headache still calls for mastoidectomy, but only rarely do the operative findings indicate whether the sinus should be incised or not. Occasionally the sinus wall is gangrenous, or pus can be seen oozing through a dehiscence in it, but far more commonly the dura mater of the outer sinus wall is covered with granulations and so thickened that palpation of the sinus is useless and one must decide from the previous clinical examination whether to incise or not. Needling the sinus does not give information of value, unless the whole lumen is completely occluded by clot, and may produce thrombosis in a patent sinus.

A study of the journals reveals advocacy of every possible permutation of the various methods. Some surgeons content themselves with mastoidectomy and wide exposure of the sigmoid sinus, as practised originally by Horsley (1890). Others perform the same bone work but tie the internal jugular vein without incising the sinus, and still others remain faithful to the technique practised so successfully by Arbuthnot Lane. Our preference has always been strongly in favour of this last, the original technique, the teaching of early textbooks having proved itself so well in actual practice.

Changes in Prognosis

Courville and Nielsen (1934) studied the necropsy findings in 1926–33 in 5227 cases and found that 124 deaths were due to the intracranial extension of otitic infection, meningitis being slightly more common than sigmoid-sinus thrombosis. In 1949–54 only 23 of 9737 deaths could be ascribed to otitis, and these workers stated that thrombosis of the dural sinuses had been practically eliminated from necropsy findings (Courville and Nielsen 1955).

Relatively few papers have been based on significant numbers of patients in the last decade, particularly the past five years.

Rosenwasser (1945) surveyed 100 patients with sigmoid-sinus thrombosis and found a mortality-rate of 27% among patients treated by the operations of sinus incision and vein ligation. He stated that the general consensus of opinion was that the death-rate was 25–36%.

Hubert (1941) analysed 119 cases. In 1929–36 95 cases of sigmoid-sinus thrombosis were treated by mastoidectomy, incision of the sinus, and ligature of the internal jugular vein, the death-rate being 32·6%. In 1937–40 24 cases were so treated but with the addition of sulphonamide therapy, and the mortality-rate was 12·5%.

Smith (1950) reported that of 22 patients treated before the introduction of antibiotics 7 died—a mortality-rate of 32%. After penicillin was available, he dealt with 8 patients, all of whom recovered.

The personal figures of one of us (P. V. R.) for 1937–45 are 50 patients treated, with 5 deaths (10% mortality); and for the period 1945–54 21 patients treated, with 2 deaths (9·5% mortality). Only 1 of these deaths was caused by pyæmia (see case-report above); the other was the result of massive and relatively aseptic thrombosis of the cortical veins and of the superior sagittal sinus.

Conclusion

This paper may figure almost as a memorial to a disease which is now nearly extinct in its original form but still appears occasionally so disguised that it is not so easily recognisable by the otologist. An obituary always implies a decent degree of regret, and it is possible that a pang of emotion may be felt at the virtual disappearance of a disease, so dangerous, yet calling on all the powers of decision, resolution, and dexterity that a surgeon can exercise.

Summary

The changes in behaviour and frequency of sigmoid-sinus thrombosis since the introduction of chemotherapy and antibiotics are considered in relation to the treatment and prognosis.

Septicæmia is now a rare complication of sigmoid-sinus thrombosis, but the suppression of infective symptoms has presented new problems in the recognition and treatment of progressive extension of the thrombus to other venous channels.

Sinus thrombosis is a complication not so much of acute as of chronic suppurative otitis media.

There is still need for mastoidectomy in selected cases; and, if a septic thrombus is known to be within the sigmoid sinus, the mastoidectomy should be followed by ligation of the internal jugular vein and removal of the infected clot.

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THE USE OF ANTHRAX ANTIGEN TO IMMUNISE MAN AND MONKEY

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THE production in vitro of a non-toxic antigenic material present in sterile filtrates of cultures of *Bacillus anthracis* has been described by Wright et al. (1954) and Belton and Strange (1954). This material effectively immunised rabbits and monkeys against subsequent intracutaneous or inhalation challenge with multiple lethal doses of anthrax spores. It has since been determined that the material prepared by the method of Belton and Strange (1954) may be stored for at least two and a half years at 0–4°C with no loss of activity (F. C. Belton unpublished).

The objects of the present studies were: (1) to test the reaction of man to repeated injection of an alum precipitate of the antigen as prepared by Belton and Strange (1954), and (2) to observe in monkeys the duration of immunity induced by two subcutaneous injections of the antigen.

Materials and Methods

Preparation of Antigen and Preliminary Testing

Vaccine was prepared by the method described by Belton and Strange (1954). The product was tested for sterility according to the Therapeutic Substances Act regulations at three stages—after filtration, after alum precipitation, and after concentration. Merthiolate 1 in 5000 was added after the first sterility test.

The antigenic activity was assessed by active immunisation tests in groups of 10 rabbits. Dilutions of the material up to 1 in 300 were given subcutaneously in two doses of 1·25 ml. per dose with a ten-day interval between doses. Seven days after the last dose the rabbits were challenged intradermally with about 250 lethal doses of anthrax spores. About half the rabbits given a 1 in 300 dilution of antigen were protected. Higher concentrations of vaccine usually gave full protection. Control rabbits were invariably all dead by the fifth day after challenge.

Before injecting humans with the material it was tested for the absence of toxicity by the methods described by Belton and Strange (1954). In addition rabbits received 50 ml. amounts of filtrate intravenously. None died or showed any deviation from the normal.

Six batches of antigen were used over the test periods, and there was no evidence that they varied in potency or in tendency to produce reactions.

Immunisation Procedure for Monkey and Man

The immunity response in monkeys was similar to that in rabbits, good protection being produced when the vaccine was diluted 1 in 100 and given subcutaneously in two doses of 1·25 ml. each with an interval of ten days between doses (Belton and Strange 1954).

The schedule for immunising humans was based on that found to be effective for monkeys, but the vaccine was diluted 1 in 4 and the dose reduced to 1 ml. (i.e., the antigen content per dose was increased 20 times), and an annual booster dose of 1 ml. was given; this procedure was selected in a purely arbitrary manner. As all the experimental work had been based on subcutaneous injection of vaccine, this method was continued even though the inoculum contained alum. The deltoid region was chosen as the site of inoculation.

Method of Challenge of Monkeys with Virulent Anthrax Bacilli

Monkeys were challenged by the inhalation route. The dose of the strain M.36 that was given contained approximately 10–15 LD.50. Controls given no vaccine were usually all dead by the sixth day. Surviving test monkeys were retained for twelve months.

Method of Recording Reactions

Reactions in man were recorded by a code devised to permit of ready analysis. In this code principal symptoms were indicated by an initial letter, followed by a numeral, indicating the number of days for which each symptom had been observed to persist:

O	No reaction of any kind
P	Local pain
R	Local erythema
S	Local swelling
L	Lymphadenopathy and/or lymphangitis
T	Pyrexia
U	Urticaria
P_1	Local pain or tenderness for twenty-four hours or less
$P_2S_2R_2$, &c.	Local pain, swelling, and redness for two days or less

A further reaction type in the form of a small painless persistent nodule was often observed; but, as these nodules never progressed to abscesses, always developed late, and bore no relation to the occurrence of other signs, records were discontinued.

Method of Titrating Antibody Level in Immune Serum

The antibody level in immune serum was assessed by the method described by Belton and Henderson (1956). Graded dilutions of immune serum are added to constant amounts of the toxin described by Smith et al. (1954), which produces a characteristic skin lesion; aliquots of these mixtures are later injected intracutaneously into the shaved skin of the rabbit, and the end point of skin lesion production is recorded next day.

Results

REACTIONS IN MAN

General Reactions

The vaccine has been administered to human volunteers in this Establishment over a period of four years. In table I the number of inoculations given is analysed according to the nature of the injection (first, second, or booster doses) and to the type of reaction that followed. It is seen that 373 persons received 1057 inoculations, 369 of them receiving two or more. The symptom P might well be discounted as largely subjective and liable to individual variation; if so, the number of inoculations unaccompanied by objective reactions of any kind was 823 (78%). Pain or tenderness was always

TABLE I—NUMBER AND TYPE OF REACTIONS IN MAN

Reaction	Injection			Total
	1st	2nd	Booster	
O *	229(61·4%)	116(31·0%)	83(26·3%)	428(40·5%)
P	119(32·0%)	167(45·0%)	109(34·6%)	395(37·4%)
R, S, L, T, & U	24 (6·4%)	76(21·0%)	116(36·8%)	216(20·4%)
Undetermined	1 (0·3%)	10 (3·0%)	7 (2·2%)	18 (1·7%)
Total	373	369	315	1057

* Terms defined in section on Methods.

very mild and usually of brief duration, persisting for more than twenty-four hours in only 27 cases. It is noteworthy, however, that there was a sharp rise in the number of cases of pain resulting from the second dose of vaccine.

In table II the reactions experienced by 83 persons who received two or more booster doses are recorded. It is seen that there was a strong tendency for reactions to increase in number and duration with successive doses, but the trend was most pronounced in the mild reactions. Erythema (R) was almost always accompanied by local tenderness and/or swelling, but for the sake of brevity erythema has been chosen as the indicator and the other symptoms have been omitted. Mild axillary lymphadenopathy was discovered twice: in one case accompanied by pain and swelling at the site of inoculation; in the other by erythema. None of the reactions caused any incapacity.

The trend towards increase in numbers of individuals reacting on repeated injection is not serious. Furthermore we have clear evidence that reactions may be observed after first, second, or a booster dose, but on subsequent injections there may be no response.

TABLE II—ANALYSIS OF REACTIONS TO BOOSTER DOSES

Reaction	Injection							
	1st	2nd	Booster					
			1	2	3	4	5	
O *	64	46	32	24	4	1	1	79·4%
P_1	17	19	32	27	3	..	..	
P_2	..	4	3	..	..	..	..	
P_3S_2	1	..	..	..	..	..	..	
$P_2S_4L_2$	..	1	..	..	..	..	..	
$P_1R_1S_1U$	..	..	..	..	1	..	..	
R_1	1	4	5	19	6	..	..	19·5%
R_2	..	2	7	7	1	..	..	
R_3	..	4	3	4	..	..	..	
R_4	..	..	1	1	..	..	..	
Undetermined	..	3	..	1	..	..	..	1·1%
Total	83	83	83	83	15	1	1	

* Terms defined in section on Methods.

Clinical Observations

The objective reactions were divisible into the following clinical types:

(1) Very mild tenderness, redness, and swelling in various combinations at the site of inoculation, which were of gradual onset and usually of brief duration.

(2) Similar but more severe reactions, usually following the second injection or a booster.

(3) Similar to the second type but accompanied by almost equally severe local reactions at the site of a previous inoculation, which had in many cases been given in the opposite arm. Some of these cases appeared to respond to antihistaminics.

(4) Immediate reaction at the site of inoculation, followed by generalised urticaria. Two such cases occurred, both rapidly controlled by antihistaminics.

There were three cases of mild pyrexia, one of which was of doubtful nature. None of the cases was sufficiently severe or prolonged to cause absence from work.

Nature of Response

In view of the tendency for occasional development of allergies an experiment was made to determine the nature of the allergen.

Three inocula were prepared as follows for intradermal injection into volunteers who had already been immunised:

(1) Alum-precipitated culture-medium containing no anthrax antigen was diluted 100 times, and 0·1 ml. (i.e., 1/1000th of the dose of alum-precipitated medium contained in the normal immunising dose) was given into the skin of the flexor surface of the right arm.

(2) Purified anthrax antigen (Strange and Belton 1954) 0·1 ml., containing 0·05 μg. (i.e., 1/100th of the antigen content of the normal immunising shot), was given into the skin of the flexor surface of the left forearm, immediately distal to the flexure of the elbow.

TABLE III—PREVIOUS RESPONSE OF VOLUNTEERS FOR INTRADERMAL TEST FOR ALLERGY

Case no.	Reactions following initial injections		Reactions following booster shots				
	1	2	B1	B2	B3	B4	B5
1	O	O	O	O	R_1S_1	O	O
2	O	O	P_1	O	$P_1R_1S_1U$	..	..
3	P_1*	P_1R_1	$P_1R_1S_1U$	..	..	..	..
4	O	P_1R_1	$P_1R_1S_4L_2T_1$	..	..	..	..
5	O	R_2	P_1	S_2R_1	..	..	..
6	P_1	P_1	P_1R_1	$P_2R_2S_2$	..	..	..
7	O	P_1	$P_2R_2S_2$	$P_2R_2S_2$	..	..	..
8	O	O	O	O	..	..	..
9	O	O	O	O	..	..	..
10	O	O	O	O	..	..	..
11	P_1	P_1	O	P_1	..	..	..

* Terms defined in section on Methods.

(3) Alum-precipitated anthrax antigen, as used in the normal immunisation procedure, diluted 1 in 100, 0·1 ml. (i.e., 1/1000th of the normal immunising dose) was given into the skin a few inches distal to the second test injection.

Eleven volunteers were chosen, who provided the widest possible range of reaction types, and these are detailed in table III.

Of these volunteers cases 2 and 3 had had immediate urticarial reactions following their last booster doses. Case 3 is also of interest in that she developed the highest toxin-neutralising titre hitherto recorded (see below). Case 4 had a mild febrile reaction after a booster dose, and also developed simultaneous flares at the sites of the two initial doses given twelve months previously. Case 11 is the only individual hitherto tested who has not produced demonstrable toxin-neutralising antibodies.

Where reactions followed the intradermal tests, urticarial weals developed at the site of inoculation within two minutes and persisted for three to six hours. No flares developed in the deltoid region, and there was no generalised urticaria. The weals could not be measured with accuracy, but some impression of their relative sizes is recorded in table IV. The largest (++++) measured about 5 cm. and the smallest (+) about 1 cm.

TABLE IV—INTRADERMAL REACTIONS IN VOLUNTEERS

Case no. (as in table III)	Inoculum		
	Medium	Purified antigen	Alum-antigen
1	–	–	–
2	–	++++	+++
3	–	++++	+++
4	–	+++	++
5	–	+++	++
6	–	+++	++
7	–	+++	++
8	–	+	+
9	–	–	–
10	–	–	–
11	–	Trace	Trace

\+ to ++++ degrees of reaction (see text).

From these various observations it is clear that the intradermal reactions were associated with anthrax antigen and not the medium, and were related in both distribution and severity to the inoculation reactions experienced by the volunteers.

A response to antihistaminics had been observed in some cases of inoculation reaction. Cases 2 and 5 (table IV) were retested the following week an hour after receiving an oral dose of 0·05 g. of tripelennamine hydrochloride ('Pyribenzamine,' Ciba). One case gave a characteristic immediate urticarial reaction and the other had a mild reaction of gradual onset. In both cases the subsequent intradermal reactions were much less severe than in the first instance and persisted for a relatively short period. This suggests that reactions to anthrax antigen, whether urticarial or not, are allergic, the severity and time of onset depending on the idiosyncrasy of the recipient. In the test series past medical histories of allergy were known in cases 2 and 3 (table IV), both of whom developed urticaria immediately after receiving respectively their third and first booster shots. No explanation, however, can be offered for the later onset of the more usual type of reaction in the non-urticarial subjects.

Though no severe anaphylactic reactions have yet been observed, it is clearly wise to proceed with caution when administering booster shots to persons with histories of allergic states.

Some delayed reactions were observed on the 3rd day after the test. In cases 3 and 4 (table IV) these consisted of a local minor flare at the sites of the intradermal injection of both the purified and the alum-precipitated anthrax antigen. In cases 1 and 5–7 the reaction took the form of a small pale painless nodule at the site of injection of the alum-antigen only. The significance of these minor reactions is not understood and seems to bear little relation to the rest of the picture.

Antibody Response

The antibody response to the vaccine was tested in 91 persons. The tests were made at various stages of the immunisation schedule, and some persons were tested more than once. The following conclusions were drawn:

(1) Of 32 persons tested after the initial two doses only 1 produced a response; but as tests were made at intervals of up to a year after the second dose, probably the serum antibodies had decreased.

(2) Of 28 persons tested during the twelve months following the first booster dose 2 did not respond.

(3) Of 20 persons tested before and after the first booster dose 18 produced a demonstrable response. Of the 2 who did not respond 1 again did not respond after a second booster.

(4) Of 30 persons tested after but not before a second booster dose only 1 did not respond, and he produced a response after a third booster.

(5) One individual was tested after the fourth and fifth booster doses and responded on both occasions.

(6) In 17 cases a fall in titre of about half in twelve months was demonstrated.

From these results it is clear that the initial two doses were inadequate to produce a lasting antibody response, but that a booster dose produced a demonstrable response in all but 1 case, but this response decreases by about a half in one year.

Three cases of special interest were observed among personnel actively engaged in work on *B. anthracis*. Of these, two showed no fall in titre during the year following a fourth booster dose, and the third showed an exceptionally high titre after a first booster. We suggest that the titres were maintained or enhanced as a result of repeated minor exposures to the organism. Specific support for this hypothesis was obtained in experiments with monkeys (see below). In spite of the considerable amount of work done on anthrax in these laboratories, with a consequent minor degree of contamination, there have been no cases of infection since the immunisation procedures were introduced.

On comparing the results of the toxin neutralisation tests with inoculation reactions, no evidence was found that there was any relation between the observed antibody titre and the severity of reaction, apart from the general tendency for both to increase with booster doses.

RESPONSE IN MONKEYS

Experiment for Testing Duration of Immunity

30 *Macacus rhesus* monkeys, each weighing 3–5 kg., were immunised with two doses of a vaccine that had been used for immunising man, and quantitatively the same amounts were given. The monkeys were divided by random sampling into three groups of 10. The first of these groups was challenged seven days after the second dose of vaccine. The second and third groups were challenged respectively one and two years later. An equal number of unimmunised controls were included in each inhalation challenge.

Result of Challenge by Respiratory Route

All the monkeys in the first two immunised groups survived; all the controls were dead by the sixth day. In the group challenged two years after immunisation 1 monkey out of a group of 7 survivors died and 1 control survived. (3 monkeys in this third immunised group died of other causes in the two years.)

Test of Immunity Level

Assessment of the serum before challenge showed a steady decrease in titre in two years; as might be expected, there was some variation between individuals in this respect. Unfortunately no figures are available for the immunity level immediately following vaccination, but at the end of a year all the unchallenged monkeys gave a serum that neutralised the test dose of toxin at a 1 in 3 dilution or higher. Tested after eighteen months the same monkeys showed neutralisation of the test dose of toxin with undiluted serum but nothing better. After two years no detectable antibody was present.

Serum obtained after challenge showed a dramatic rise in antibody titre, the test dose of toxin being inhibited by a dilution of at least 1 in 256 of each serum. The most probable explanation of this rise is that a degree of invasion of the immunised host did take place in such a manner that a sharp secondary immunity stimulus was given. There was an interesting increase in immune response in 1 monkey which was sick for three days following the third challenge; a month after challenge this monkey's serum was active at a dilution of 1 in 512. The surviving control monkey in this experiment was similarly sick and also developed an antibody titre of between 1 in 256 and 1 in 512. These facts indicate that the illnesses were due to specific but transitory infection.

The limits of the rabbit skin test are clearly shown in the results of the last challenge. No immunity was demonstrable in the serum before challenge, but 6 of 7 monkeys survived. It therefore seems safe to assume that, if the capacity for neutralising toxin is detectable in an immunised monkey's serum, it is highly probable that the monkey will be immune to exposure to *B. anthracis* by the respiratory route. By the same reasoning one might conclude that, if human serum shows similar capacity, the individual will be amply protected against chance infection.

Summary

1057 doses of alum-precipitated anthrax antigen were administered to 373 people by the subcutaneous route.

Reactions were mild but tended to increase in frequency but not in severity with successive doses given in the form of an "annual booster." The incidence of febrile reactions was very low (0·19%). There was no incapacitation for work.

A reaction after one dose did not necessarily predispose to subsequent reactions.

There is no evidence of any connection between the severity of reaction and the site of inoculation relative to previous injections.

Intradermal tests in immunised people suggested that the reactions were allergic and were associated with the antigen and not with impurities in the vaccine. Antibodies neutralising anthrax toxin can be demonstrated in the blood of immunised people; only 1 exception to this was found in 91 persons examined.

No relationship was demonstrated between the antibody level and reaction to inoculation.

Experiments on monkeys suggested that the immunisation procedure used for man was effective, particularly when demonstrable circulating antibody was present.

Experiments on monkeys showed that two injections of antigen protected for at least one and probably nearer two years.

There is evidence that the antigen remains fully effective for man and animals on storage for at least two and a half years.

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REVISION TO THE ROUX-EN-Y ANASTOMOSIS FOR POST-GASTRECTOMY SYNDROMES

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THE commonest post-cibal syndromes which follow partial gastrectomy for peptic ulcer are dumping and bilious vomiting.

Dumping

The patient experiences epigastric fullness, faintness, nausea, and languor after food. Sweating and palpitations may occur. Relief is obtained only by lying down until the attack subsides.

The symptoms of dumping can be reproduced after the Polya gastrectomy by inducing hyperperistalsis in the jejunum. This can be done by balloon distension of the efferent loop or by introducing a hypertonic solution into it (Machella 1949); and it was thought that the stimulus normally arises from the efferent loop as a result of rapid gastric emptying. In bilious vomiting due to afferent-loop stasis, however, premonitory symptoms, when present, are identical with those of dumping; and it has been considered that—although dumping can exceptionally occur following gastroduodenal anastomosis—in most cases dumping and bilious vomiting are both attributable to afferent-loop stasis (Wells and MacPhee 1952).

Bilious Vomiting

Careful clinical assessment of patients with bilious vomiting permits their subdivision into two groups—those with simple bile reflux, and those with associated symptoms of dumping attributable to afferent-loop stasis.

Bile reflux.—Here the complaint is of bile welling up to the mouth without any premonitory symptoms. The regurgitation bears no definite time-relation to meals but frequently occurs on stooping or lying. The patient may be wakened at night by a choking sensation due to bile in the pharynx. Heartburn or a feeling of retrosternal rawness, due to tryptic œsophagitis, may succeed the reflux.

These symptoms may follow the Billroth-I gastrectomy and have in our experience also followed gastrectomy with the Polya or Steinberg anastomosis performed as a primary procedure for the relief of peptic œsophagitis due to sliding hiatus hernia. Their occurrence led to our using the Roux gastrectomy with vagotomy for such cases (Wells and Johnston 1955). We believe that bile reflux is due to retraction and incompetence of the cardia, which may be present at the time of the original operation or develop later. The clinical syndrome may thus follow any operative procedure which allows free entry of duodenal contents into the stomach. It is more common after gastrectomy than after gastro-enterostomy because gastrectomy reduces the capacity of the stomach.

Bilious vomiting with afferent-loop stasis.—Shortly after meals the patient develops nausea, faintness, and epigastric fullness which may amount to pain. The symptoms become progressively more severe until suddenly a variable quantity of bile, unmixed with food, is vomited with immediate relief. The syndrome most commonly follows the high Polya gastrectomy and is due, we believe, to a kink developing in the afferent loop where it joins the lesser curve of the stomach. After a meal the obstructed jejunum fills with bile and pancreatic secretions, and tension rises until the loop empties rapidly into the stomach and some or all of its content is regurgitated. Incompetence of the cardiac sphincter, if present, plays a significant rôle by facilitating the flow of bile from the suddenly distended stomach. In five of our ten patients with loop stasis X-ray examination showed free gastro-œsophageal reflux. Delay in emptying the afferent loop causes inadequate mixing of the duodenal contents and food; and this contributes to deficiency states with steatorrhœa and loss of weight and energy. Hyperperistalsis in the afferent loop may spread to the efferent loop and cause intestinal hurry.

Discussion

It is generally agreed that all these syndromes are infrequent after gastroduodenal anastomosis but slightly commoner after gastrojejunal anastomosis. Although the exact mechanism of their production is still disputed, the altered arrangement of the upper alimentary tract is certainly responsible. However, the liability to vomiting may also be affected by incompetence of the cardio-œsophageal sphincter, such as is found in hiatus hernia.

We here record our experience with twenty-one patients in whom these syndromes were treated by revision of the

TABLE I—RESULTS IN PATIENTS WITH DUMPING

Case	Sex and age	Former operations	Origina lesion	Weight change after gastrect.	Date of revision	Present symptoms	Weight change after revision
1	M., 51	1949, vagotomy. 1949, Polya gastrect.	D.U.	−1½ st.	Jan., 1955	None	None
2	M., 46	1954, Polya gastrect.	D.U.	−1st.	May, 1955	Slight nausea after meals	None
3	M., 62	1945, Polya gastrect.	D.U.	−1st.	June, 1955	None	+2 st.

M = male. Gastrect. = gastrectomy. D.U. = duodenal ulcer.

TABLE II—RESULTS IN PATIENTS WITH BILE REFLUX

Case no.	Sex and age	Former operations	Original lesion	Weight change after gastrect.	Date of revision	Present symptoms	Weight change after revision
4	M., 56	1940, Polya gastrect.	D.U.	None	April, 1954	None	None
5	F., 40	1952, Steinberg gastrect.	H.H.	− 1½ st.	Oct., 1954	None	Slight +
6	F., 58	1951, Vagotomy, gastro-enterost. 1951, Polya gastrect. 1952, revision to Billroth I	D.U.	+ ½ st.	Oct., 1954	None	+ 2 st.
7	F., 52	1952, Gastro-enterost. 1952, Polya gastrect. 1954, revision to Billroth I	D.U.	− 3 st.	Dec., 1954	Occas. regurgitation	+ 1 st.
8	M., 53	1949, Polya gastrect. 1954, vagotomy	D.U.	None	April, 1955	None	+ 2 st.
9	M., 55	1952, Polya gastrect.	D.U.	None	July, 1955	None	+ 2 st.
10	F., 50	1952, Steinberg gastrect.	H.H.	− ½ st.	July, 1955	Occas. regurgitation	None
11	M., 48	1938, Gastro-enterost. 1945, Polya gastrect. 1951, vagotomy	D.U.	+ ½ st.	Sept., 1955	None	+ 1 st.

M = male. F = female. D.U. = duodenal ulcer. H.H. = hiatus hernia.

anastomosis to the Roux-en-Y type, in imitation of the method previously advocated by us in the treatment of hiatus hernia itself.

Whilst the afferent-loop syndrome cannot of course play a part in bilious vomiting after Billroth-I gastrectomy, a distinction cannot always be drawn between simple bile reflux and bile reflux associated with afferent-loop stasis. Probably some cases which present the clinical syndrome of simple reflux have in fact an added element of stasis. In these the absence of premonitory symptoms may be due to the relatively slight degree of stasis in the afferent loop, or to the patient having a high threshold for visceral and vasomotor sensations.

Analysis of Clinical Groups

Dumping

On this hypothesis we have treated three cases of severe dumping by revision to the Roux-en-Y anastomosis; and we were encouraged by finding that in each case the afferent loop was dilated and hypertrophied. All three patients, who were severely distressed after meals, are now virtually free from symptoms and have much more energy (table I). Patients 1 and 2, who had been unable to work since their gastrectomy, have now returned to duty. One of these three patients has gained weight since the revision operation.

Bile Reflux

Eight patients fall into this clinical group (table II). In seven there was gastro-œsophageal reflux on radiological examination. Two patients were known cases of hiatus hernia at the time of gastrectomy; and in them, and in three of the remainder, the symptoms of bile reflux followed immediately upon the initial operation. In patient 4 the onset was delayed for several years. Patient 8 developed reflux after the performance of vagotomy; and in patient 11 the symptoms were exacerbated by this operation. Presumably the œsophageal mobilisation required to expose the vagi in these cases facilitated retraction of the cardia. Patients 6 and 7 had each undergone gastro-enterostomy, Polya gastrectomy, and revision to Billroth-I anastomosis. Bilious vomiting persisted after each operation.

In this group all patients have been completely relieved of bilious regurgitation. Six are free from post-cibal symptoms. Five have found that since the revision, they can take a much larger meal; and they have gained a considerable amount of weight. It is unlikely that bile reflux per se plays a significant part in deficiency states after gastrectomy. Possibly deviation of bile from the stomach increases gastric capacity; or there may have been some degree of afferent-loop delay in three of these patients. In the other two the preceding operation had been a Billroth-I gastrectomy.

Bilious Vomiting with Afferent-loop Stasis

Ten patients fall into this group (table III). Six of them now have no symptoms, except (in some) a sensation of fullness after a large meal. Six have gained weight. Patient 15, who had been unable to follow his employment for six years after the gastrectomy, has now returned to work. Patient 16 continues to suffer from palpitations after a large meal, but this symptom is less severe since the revision operation.

Four patients in this group, and two in the previous one, complain of regurgitation of food, especially after large meals with fluids. The regurgitation is not prevented by the maintenance of a vertical posture. In three patients the symptom is no more than a slight inconvenience—a mouthful or so of liquid being regurgitated—but in patients 7, 10, and 14 it is more severe and partly digested food may come back.

Radiological examination in these six patients shows no obstruction to the passage of barium through the stomach and jejunum, but in each there is marked reflux from the stomach to the œsophagus. Negus (1936) considered that the œsophageal dilatation attributed to "cardiospasm" is caused not by obstruction at the

TABLE III—RESULTS IN PATIENTS WITH AFFERENT-LOOP STASIS

Case no.	Sex and age	Former operations	Original lesion	Weight change after gastrect.	Date of revision	Present symptoms	Weight change after revision
12	M., 33	1950, vagotomy, gastro-enterost. 1950, entero-anastomosis 1951, Polya gastrect. 1952, jejunoplasty	D.U.	None	Sept., 1954	Occas. regurgitation	None
13	M., 39	1949, Polya gastrect.	D.U.	− ½ st.	Oct., 1954	None	+ ½ st.
14	F., 48	1954, Polya gastrect.	D.U.	− 2½ st.	Nov., 1954	Regurgitation, lack of energy	None
15	M., 61	1948, Polya gastrect.	D.U.	None	Nov., 1954	None	+ 1½ st.
16	F., 45	1953, Steinberg gastrect.	H.H.	− 1 st.	Dec., 1954	Palpitations after food. Slight regurgitation	None
17	F., 55	1954, Polya gastrect.	D.U.	− 2 st.	Dec., 1954	None	+ ½ st.
18	F., 54	1955, Polya gastrect.	G.U.	− 1 st.	July, 1955	Slight regurgitation	+ ½ st.
19	M., 69	1951, Polya gastrect.	D.U.	− 1½ st.	July, 1955	None	+ ½ st.
20	F., 67	1950, Polya gastrect.	D.U.	Slight +	Sept., 1955	None	Slight +
21	F., 53	1952, Steinberg gastrect.	H.H.	− 1 st.	Oct., 1955	None	None

G.U. = gastric ulcer. D.U. = duodenal ulcer. H.H. = hiatus hernia.

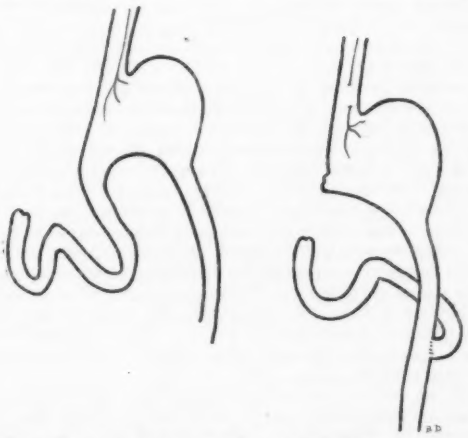

Diagram of the loops before (left) and after (right) revision of a gastrectomy from the Polya to the Roux.

cardia but by loss of tone and incompetence of the cricopharyngeal sphincter; peristalsis thus results in food only churning up and down the œsophagus, and not in any progressive movement. We believe that a similar mechanism may be active in patients who regurgitate food from the stomach, the significant lesion being the incompetent cardio-œsophageal sphincter.

Deficiency States

In the series as a whole, thirteen patients had lost weight as a result of the gastrectomy. Voluntary restriction of diet, because of post-cibal symptoms, and intestinal hurry resulting in faulty absorption, are factors in the ætiology of weight loss; but probably the most important cause after the Polya gastrectomy is inadequate mixing of food with bile and pancreatic secretions. This is aggravated by delay in emptying of the afferent loop.

Eleven patients have had a significant weight gain following the revision operation. Eight, who had lost weight after the gastrectomy, have been almost free from symptoms since the revision and have no clinical evidence of afferent-loop stasis; but their weight is either unaltered or still below the pre-gastrectomy level. The failure to regain weight in these patients may be partly due to delay in the secretion of pancreatic juices, because the stimulus normally produced by food and acid in the duodenum is lacking. As there were no cases of vitamin-B deficiency or of severe anæmia, the effect of the revised anastomosis on these states is not known.

Several patients noticed that for some weeks, or even months, after the revision operation, the bowel actions were more frequent, and the stools rather loose and light in colour. This has improved with time in all cases; but it still persists to some degree in patients 2, 14, and 15 who have two or three bowel actions daily. Analysis of the stools in one of these showed no excess of fat.

Technique of the Revision Operation

Vagotomy, if not already performed, is carried out in the usual way. It is interesting to palpate the œsophageal hiatus of the diaphragm which is usually found to be considerably enlarged when there has been radiological evidence of retraction of the cardia.

Where the previous operation was a Polya gastrectomy the afferent loop is divided near the lesser curve of the stomach, and the gastric end is closed. Only a very small mesenteric incision is required to enable the other end to be passed posterior to the efferent loop to which it is then anastomosed end to side, about 10 in. from the stomach. To avoid any possibility of narrowing the bowel lumen, we use here an edge-to-edge suture technique (Wells and Johnston 1955). The afferent loop was found to be dilated, hypertrophied, or kinked in five cases of loop stasis, and in each of the three dumping cases.

Recurrent Ulceration

The Roux-en-Y anastomosis was formerly condemned for the treatment of peptic ulcer because of the high incidence of stomal and jejunal ulceration. So far we have seen no evidence of this. Fractional test-meals or 'Diagnex' tests performed some months after the revision operation have shown achlorhydria or very low acid levels, suggesting that vagotomy with the standard gastrectomy protects the Roux stoma from this complication.

Summary

Three forms of post-gastrectomy syndrome are described: (1) dumping, (2) bile reflux, and (3) bilious vomiting with premonitory symptoms (the afferent-loop syndrome).

The possible relation of cardio-œsophageal incompetence to reflux and vomiting after gastrectomy is discussed.

Conversion of a pre-existing gastrectomy of any other type to a Roux-en-Y anastomosis (with vagotomy) is suggested as a reasonable method of treatment in selected cases, particularly having regard to the usefulness of this procedure in sliding hiatus hernia. The technique of the operation is briefly described.

The results of such a conversion in twenty-one patients are presented. There was complete relief in fourteen and considerable relief in the remaining seven. Amongst these, six had slight or occasional reflux of unaltered food attributable to a lax cardia, one had slight nausea and another palpitations after food. Weight gain was also noted.

In this series there has so far been no recurrent ulceration.

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EFFECTIVE UTERINE BLOOD-FLOW DURING EXERCISE IN NORMAL AND PRE-ECLAMPTIC PREGNANCIES

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THE current belief that pre-eclampsia is associated with a reduction of uterine blood-flow has received support from the figures we published (Morris et al. 1955) and from those of Cox and Chalmers (1953) and of Johnson and Clayton (1955), both of whom approached the problem from a somewhat different angle. From both our series of observations and those of Johnson and Clayton the reduction of uterine blood-flow and the severity of the pre-eclamptic condition, measured by the diastolic blood-pressure, corresponded closely. Since our first communication, moreover, we have measured the resting

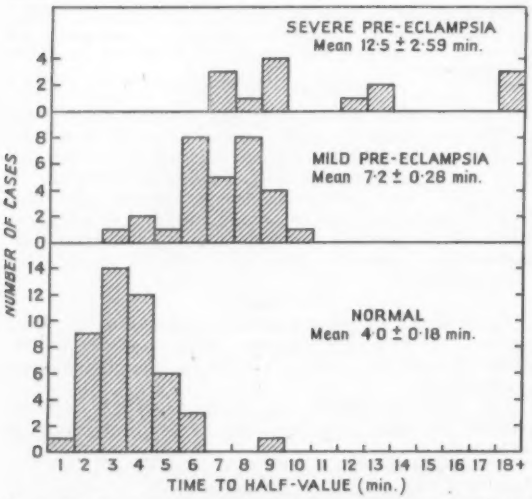
SEVERE PRE-ECLAMPSIA
Mean 12·5 ± 2·59 min.
MILD PRE-ECLAMPSIA
Mean 7·2 ± 0·28 min.
NORMAL
Mean 4·0 ± 0·18 min.
NUMBER OF CASES
TIME TO HALF-VALUE (min.)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18+

Fig. 1—Uterine clearance-time for ^{24}NaCl at rest in normal, mild, and severe pre-eclamptic pregnancies.

uterine clearance-time for the sodium ion in a further 26 normal and 29 pre-eclamptic pregnancies, and this extended series confirms our original figures. The distribution of flow times for these cases, together with those of our first series, a total of 90 observations, is shown in fig. 1. Though there is a statistically significant difference in the means of the groups, there is some overlap at their limits, which may be due to the difficulty in defining the borderline between mild pre-eclampsia and normality, and between various degrees of severity in the clinical condition recognised as pre-eclampsia.

It is well established that, in many cases of pre-eclampsia, rest in bed may alone bring about a fall in blood-pressure to within normal limits, whereas deterioration often follows the continuation of a normally active life. For this reason it seemed of considerable interest to discover whether exercise altered the effective uterine blood-flow. We have, therefore, allowed both normal and pre-eclamptic women to undertake moderate exercise and have measured the uterine blood-flow before, during, and immediately after this exertion.

Methods

The method of measuring effective uterine circulation was the same as that described previously (Morris et al. 1955). This method assumes that the rate of removal of a diffusable ion (^{24}Na) from an injection site is related to tissue (Kety 1948, 1949). In the present study, after the abdominal wall had been infiltrated with 1% lignocaine hydrochloride, 0·3–0·4 ml. isotonic radioactive saline, with an activity of 5–10 μC, was injected through a no. 0 needle into the uterine muscle. A screened γ-ray Geiger-Müller counter (type G 4 Pb. 20th Century Electronics) was immediately placed over the site of injection and attached to the skin with adhesive tape. Counting-rates, at $^1/_2$-minute intervals, were made with a counting-rate meter. After a correction had been made for the rising background count dependent upon the material from the injection depot progressively entering the general circulation, the results were expressed as the "time to half-value"—i.e., the time required for the counting-rate over the injection depot to fall to half its initial value or, in other words, the time taken for half the injected material to be removed from the site. Similar and parallel observations, using the same volume and activity of saline solution, were made in the leg, to give a control series of figures for skeletal muscle. This injection, into the anterior belly of the quadriceps in the mid-thigh region, was made simultaneously with that into the uterine wall.

Two sets of observations were made on each woman: first, when she was as relaxed as possible in bed; second, during and after exercise on an "exercycle" devised for bed use (fig. 2). The cycle consisted of pedals mounted to work against constant pressure, revolutions and "speed" being recorded. The woman was told to pedal to maintain the "speed" of 10 m.p.h. for 4–5 minutes. She was then stopped, the uterine and leg injections were made as rapidly as possible, and, as soon as the counters were again in position, she was requested to continue cycling for 6–9 minutes more. This exercise, on average 450 revs. in 10–16 minutes, represented a rate of working of 9 foot-pounds per sec. There was no difference between the normal and hypertensive groups in the amount of work done.

At the end of the period of exercise, the woman was asked to rest while counts were made during the first minutes of relaxation. Throughout the observation the blood-pressure was measured frequently before, during, and after exercise.

Material

In this series of observations the clearance-rates of radiosodium from uterine and thigh muscles were determined in 21 normal pregnant women and 19 pre-eclamptic patients. The tests were made between the 32nd week of gestation and term. The coöperation of the women was excellent after the nature of the observations had been explained to them; indeed the patients in the antenatal ward who were not investigated often felt aggrieved at not being subjected to the test. The injection caused little discomfort, but a few women reported a deeply situated momentary prick when the visceral peritoneum was pierced. Often the simple injection into the thigh with a no. 17 needle was considered worse than that through the abdominal wall.

The women were divided into two groups: (1) normotensive patients admitted to the antenatal ward for conditions other than those likely to affect their general hæmodynamics—e.g., disproportion, abnormal lie, and previous cæsarean section—and (2) hypertensive women whose condition appeared to depend wholly on the present pregnancy. The criterion of severe or mild pre-eclampsia was based on the diastolic blood-pressure; those with pressures of 85–95 mm. Hg were considered to be "mild," and those with a higher pressure "severe."

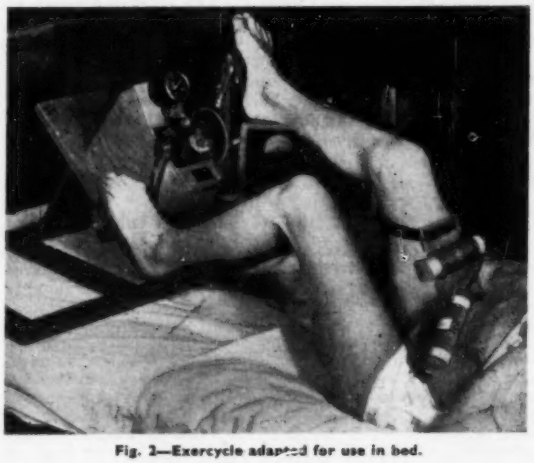

Fig. 2—Exercycle adapted for use in bed.

Results

Blood-pressure

By the definition of pre-eclampsia adopted the blood-pressures of women in this group differ from those of the normal. No woman whose diastolic blood-pressure was above 85 mm. Hg was included in our series of normal gestation. In the pre-eclamptic group considerable care was taken to exclude any woman who might have hypertension from some cause other than the present pregnancy. The average resting diastolic blood-pressures for the two groups were significantly different ($p<0.01$).

The effects of exercise on the diastolic pressures (mm. Hg) in both groups were as follows :

	Resting	*During exercise*	*After exercise*
Normals	73·3 ±1·75	85·5 ±2·22	75·8 ±2·31
Pre-eclamptics ..	93·3 ±1·71	98·9 ±2·53	91·4 ±2·45

In both the normal and the pre-eclamptic groups during exercise there was a significant rise in diastolic pressure over the resting level ($p<0.01$). In the 5 minutes following cessation of exercise the pressure fell rapidly towards the resting level.

Uterine Clearance-rate

The observations on normal and pre-eclamptic women while at rest showed the same characteristics as those originally reported. The mean half-clearance times for the two groups were significantly different ($p<0.01$), that found for normal pregnancy being almost half that for the pre-eclamptics. From this it is inferred that the effective uterine blood-flow in the normal woman is almost twice that present in the wall of the uterus in pre-eclampsia.

The effects of exercise on the uterine clearance-times (minutes) were as follows :

	Resting	*During exercise*	*After exercise*
Normals	4·07 ±0·27	5·43 ±0·42	3·07 ±0·43
Pre-eclamptics ..	7·17 ±0·22	8·75 ±0·52	6·25 ±0·53

In both groups there was a statistically significant increase in uterine clearance-rate during exercise ($p<0.01, <0.02$ respectively)—i.e., there was a diminution in effective uterine blood-flow of about a quarter in the normal and about a fifth in the pre-eclamptic group. In the first 5 minutes following exercise, however, when the women were instructed to relax completely, the uterine blood-flow improved over the original resting figure.

To give an over-all picture of the range and of individual variations of the changes observed during the experimental period, the uterine flow-rates for each of the 21 normal and 18 pre-eclamptic women are set out diagrammatically in fig. 3. Each line joins the three appropriate points for one woman ; the slope of the line depends upon the extent of change in the half-clearance time. In the normal group an increased flow-rate (decreased half-clearance time) was observed in one instance only (broken line), whereas in the pre-eclamptic group there was an increased flow-rate in two cases.

Leg Clearance-rate

In the resting state no significant difference in the half-clearance time of skeletal muscle was found in the legs of normal and of pre-eclamptic women. The average for 29 normal women was 14·0 minutes, a figure which corresponds satisfactorily to those observed by Kety (1949) and McGirr (1952). Under the same conditions of rest the average figure for 25 women with pre-eclampsia was 14·7 minutes, a finding which suggests that vasospasm of skeletal muscles does not play an important part in the ætiology of this condition.

The effect of exercise in the two groups of women was almost the same. In both of them the blood-flow in the thigh muscle during exercise was almost double that in the resting state. When exercise stopped, the flow diminished rapidly and the half-clearance time was, in all but one instance, greater than that observed initially. The clearance-times (minutes) were as follows :

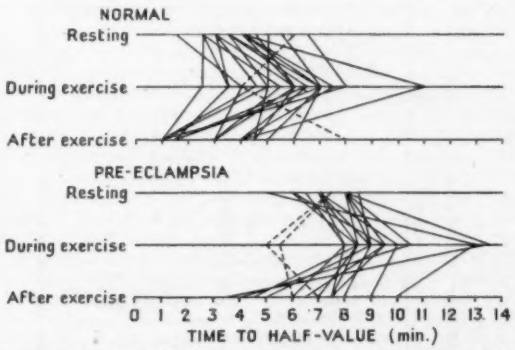

Fig. 3—Distribution of individual observations in normotensive and in pre-eclamptic patients, before, during, and after exercise.

	Resting	*During exercise*	*After exercise*
Normals	14·15 ±1·56	6·96 ±1·01	18·69 ±2·25
Pre-eclamptics ..	14·71 ±1·29	7·85 ±0·98	15·00 ±2·08

Discussion

A rise in both systolic and diastolic blood-pressure with exercise in patients without cardiac abnormality is an accepted physiological finding. The systolic pressure may reach high levels, whereas the diastolic pressure seldom increases by more than 15 mm. Hg on moderate exertion (Norris et al. 1953). Our observations in pregnant women show a similar trend ; the greatest rise in systolic pressure among normotensive women was 40 mm. Hg, and that in the pre-eclamptic group was 70 mm. Hg. On the other hand, the diastolic pressures, which in no instance increased by more than 15 mm. Hg, rose to a somewhat greater average height in normotensive women (average 12·2 mm. Hg) than in the pre-eclamptic group (average 5·6 mm. Hg)—an effect which may depend on a greater cardiac reserve in the normal women. When exercise stopped, the diastolic pressure in both normotensive and pre-eclamptic women usually fell during the first minutes either to the resting value or, often, even lower.

Coincident with these changes in blood-pressure, alterations in the blood-flows of both leg and uterine muscles were observed. During exercise there was an increase in leg-muscle blood-flow, a finding which confirms those of Kety (1949) and Wisham et al. (1951). At the same time the effective uterine blood-flow was reduced ; hence in normotensive women the flow during exertion often approached that recorded in pre-eclamptic patients at rest ; in pre-eclamptic women, the uterine blood-flow, which was already diminished even while resting, decreased still further during exercise. On the cessation of the exercise the changes in leg and uterine blood-flows were reversed. Associated with the fall in diastolic blood-pressure, the leg-muscle blood-flow was diminished while that to the uterus was increased. The restoration of uterine blood-flow was often so dramatic, leading to a faster clearance-rate than that initially recorded, that we suggest the term " flush back " for this phenomenon.

From these observations it is apparent that, during exercise, there is a diversion of blood from the splanchnic area to the skeletal musculature of the legs, and that this diversion is rapidly reversed after exercise is stopped.

Both at rest and during exercise the effective uterine blood-flow was found to be inversely correlated with the diastolic blood-pressure. This finding led us to re-examine all data which we had collected in this and other studies on uterine blood-flow in normotensive and pre-eclamptic women at rest. In the 90 observations (fig. 4) available there was a coefficient of correlation of -0.55 ± 0.11 ;

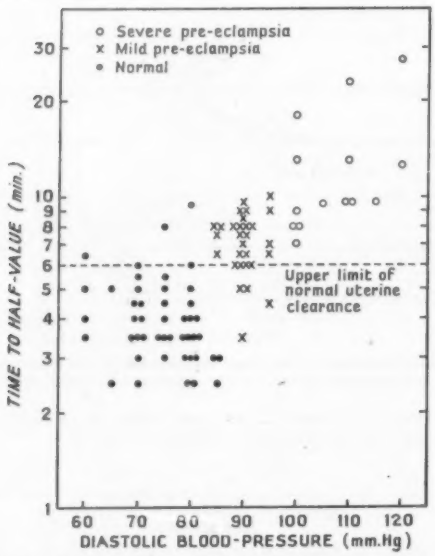

Fig. 4—Correlation between uterine clearance-time and diastolic blood-pressure.

hence the greater the diastolic blood-pressure the less is the effective uterine blood-flow.

The ætiology of pre-eclampsia is still unknown, but it is likely that its characteristic hypertension depends on arteriolar constriction. Our observations on pre-eclamptic and normotensive women show that, both at rest and during exercise, there is no significant difference in the blood-flow to the muscles of the legs, and that there is, therefore, probably no abnormal vascular resistance in the skeletal muscles in pre-eclampsia. This finding accords well with that of Burt (1950), whose plethysmograph studies showed that the blood-flow volume to the skin and musculature of the forearms was as great in pre-eclamptic as in normal women during pregnancy or greater. On the other hand, the observations that there is a reduced uterine and placental blood-flow support the view that the vasoconstriction is mainly localised in the splanchnic organs. It is known that the normal resting blood-flow to the abdominal viscera is in excess of their oxygen requirements, with the result that during muscular activity their blood-supply can undergo considerable diminution without detriment. In pregnancy the ability of the conceptus to withstand blood-flow fluctuations due to maternal activity depends both on this reserve and on an efficient functional development of the placenta.

Though the pressor mechanism in pre-eclampsia has not yet been elucidated, it is likely that, as the intensity of the vasospasm increases, it will progressively reduce the blood-flow in the splanchnic organs. In pre-eclampsia this diminution usually is not great and the blood-flow to the uterus is still sufficient for fœtal needs in spite of further reduction caused by maternal activity. In the extreme case, however, the additive effect of reduction of uterine blood-flow by exercise and that dependent on the pre-eclamptic vasoconstriction might endanger the growth or viability of the fœtus. In the women whom we examined this extreme condition was not present, and we consider that the phenomenon of "flush back" may represent the reserve powers of the uterus to withstand the effects of reduced blood-flow during exercise. During the 5 minutes following exercise the pre-eclamptic women showed a fall in blood-pressure to levels below their initial figure, and this was accompanied by a corresponding improvement in the uterine clearance-rate. Such an improvement may well correspond to the reactive hyperæmia recognised in skeletal muscles after a period of diminished blood-flow. The fact that "flush back" was greater in the pre-eclamptic women suggests that in them the uterine hypoxia was greater than among the normal women.

It is recognised clinically, moreover, that after pre-eclamptic hypertension has developed, the continuation of an active life is usually associated with a deterioration of the patient's state. Our present observations lead us to speculate whether exercise in such cases, by temporarily reducing the blood-flow and increasing the vasoconstriction, does not, in turn, further stimulate the underlying pressor mechanism and establish a vicious cycle which is more difficult to reverse. Whether this hypothesis is acceptable or not, the observations recorded here nevertheless provide a rational basis for the empirical treatment of pre-eclampsia by rest and sedation. Under basal conditions produced by such treatment the blood-pressure is reduced to a minimal level, skeletal circulatory requirements are lowered, and thus the blood-flow to the uterus, in common with the other splanchnic organs, is maintained at as satisfactory a level as possible.

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PATHOLOGICAL FRACTURES

TREATMENT BY INTERNAL FIXATION AND IRRADIATION

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PATHOLOGICAL fractures through metastases in bone often immobilise the patient. When he is old and frail, or when he has widespread malignant disease, there is little chance of restoring him to activity by conventional methods. A means of achieving early painless ambulation would be a great benefit.

The internal fixation of pathological fractures offers many advantages (Küntscher 1940, Cave 1949, Ehrenhaft and Tidrick 1949). Pain usually disappears within a few days; and, freed from external splints, plaster-casts, and the paraphernalia essential for adequate traction, the patient becomes mobile even though still confined to bed. Nursing is greatly eased, and commonly the patient can soon return home, releasing the hospital bed for other cases. Furthermore radiotherapy of a fracture through a metastatic tumour deposit is facilitated, since better access is afforded for the multiple-field applications that may be necessary if the tumour is not very radiosensitive. Lastly, the patient may quickly get up and about, even though there are no radiographic signs of union of the fracture.

Internal fixation cannot be carried out satisfactorily if excessive involvement of the bone precludes stability of the pin and fragments. Malignant infiltration of tissues

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A B

Fig. 1—A, Pathological fracture of shaft of femur through metastasis from well-differentiated carcinoma of thyroid. B, Healing and recalcification of fracture after conventional fixation and fourteen months' immobilisation. No other treatment given. Patient still bedridden.

at the fracture site may rule out closed reduction. Open reduction carries the theoretical danger of tumour fungation; but we believe that this danger is overrated. The risk of secondary infection of the bone is small, provided the technique is scrupulously aseptic; antibiotics should be given if there is the slightest suspicion that this complication has arisen. With both benign and malignant conditions there is a risk of fat-embolism (Häbler 1949), which may occur after a fracture without internal nailing. This complication developed in no case in the present series.

A theoretical complication of internal fixation of pathological fractures, which we have not in fact encountered, is dissemination of tumour cells. Peltier (1951) has shown experimentally that insertion of a nail into the bone-marrow cavity will lead to dissemination of a local deposit of cells throughout the bone; and even in the absence of this evidence there would be no reason to doubt that such a procedure forces malignant cells out into the blood-stream. But with highly malignant tumours dissemination is equally likely to follow the fracture itself; and any theoretical acceleration of the disease by nailing must be weighed against the real gain of a further period of active life. On the other hand, pathological fractures through apparently solitary metastatic deposits from tumours of low-grade malignancy will sometimes unite after external fixation or without additional irradiation (fig. 1), and the trauma of internal fixation may hasten the spread of a tumour which would otherwise carry an excellent prognosis. If tumours likely to behave in this way could be identified in advance, they might be better treated by external fixation.

Surgical Techniques

The operation should be done at the earliest opportunity, since any delay will increase the difficulty of resetting the displaced fragments. Postoperative swelling is the rule, but pain is not severe and can be controlled by analgésics. The method of internal fixation will vary with the site of the fracture. The techniques are identical with those adopted for the internal fixation of non-pathological fractures, and the same attention must be paid to gentle handling of the tissues, accurate placing of the chosen device, and absolute asepsis. An antibiotic cover is advisable if there is any doubt as to the complete sterility of the procedure. Closed reduction of the fracture is clearly the safest method, but open reduction may be needed because of malignant infiltration at the fracture site. The bone is often more extensively involved than is suggested by radiographic examination and the greatest care may be necessary to avoid splintering the thin residual cortex.

Prophylactic internal fixation of bones involved by metastatic tumour deposits is indicated when a fracture is thought to be imminent. This was undertaken in 3 cases in the present series (shaft of femur, femoral neck, and shaft of humerus). No clinical fracture of the nailed bones occurred subsequently. The operation is particularly simple since the bone is not displaced.

Pathological fractures through *benign bone lesions* may benefit from internal fixation, but often there is no delay in union. Fractures through bones involved by *Paget's disease* are as a rule better treated by external fixation, which results in rapid and sound healing. Bowing and sclerosis of the shaft and narrowing of the medulla may lead the unwary operator into serious technical difficulties; and internal fixation is probably best avoided unless the age, general condition, and circumstances of the patient suggest that prolonged immobilisation is inadvisable.

SHAFT OF FEMUR

For fractures of the shaft of the femur intramedullary nailing with a Küntscher-type nail is the most satisfactory method. The stainless-steel Küntscher nail has a clover-leaf section and is strong enough to enable the patient to get about, without bearing weight on the limb, soon after operation.

In the present series 7 malignant and 1 non-malignant pathological fractures of the shaft of the femur have been stabilised with a Küntscher nail. At least 3 of the fractures through metastatic tumour deposits were found on X-ray examination to have healed. The longest survival to date is twenty-one months. All patients in reasonable health quickly became ambulant.

Satisfactory Healing

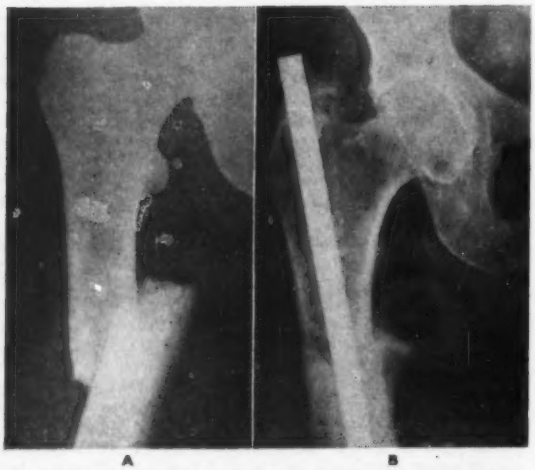
Case 1.—A woman, aged 71, admitted elsewhere with pathological fracture of shaft of femur three months after radical mastectomy for carcinoma of breast. Referred for consideration of irradiation eighteen days after admission. A Küntscher nail was inserted and the operation was followed by deep X-ray therapy and intramuscular testosterone propionate 100 mg. daily for four months. By this time the patient was walking well with two sticks. Twenty months after the fracture radiographic examination showed good healing with pronounced sclerosis, but two other bony metastases had developed and are now being treated (fig. 2).

Early Ambulation

Case 2.—A woman, aged 63, admitted with pathological fracture of femur six months after pneumonectomy for bronchial carcinoma. The patient was in very poor condition; but operation seemed to be justified by extreme pain, and a Küntscher nail was inserted. During the night after the operation the patient was found walking about the ward. She died from cardiac failure ten days after the operation, and at necropsy tumour was found involving the pericardium and heart.

Prophylactic Fixation

Case 3.—A man, aged 53, found to have a metastasis in femoral shaft from a bronchial carcinoma. Pathological fracture appeared imminent and prophylactic nailing was carried out, after a course of radiotherapy to the femur. Three days after operation he was discharged home, where he died three months later. Further radiographs before his death showed that a fracture had occurred, but this had not given rise to any symptoms or signs—presumably owing to the support afforded by the nail.



A B

Fig. 2—A, Pathological fracture of shaft of femur through metastasis from carcinoma of breast. B, Healing and recalcification of fracture fourteen months after internal fixation and radiotherapy. Patient walking well, with two sticks, four months after fracture.

UPPER FEMUR

If the fracture occurs through a metastatic deposit in the head, or high in the neck, of the femur, excision of the femoral head and neck, with or without replacement by a prosthesis, may be a more satisfactory procedure. When the fracture is lower in the neck, or in the trochanteric region, a trifin nail or nail and plate should be used. Subtrochanteric fractures are probably better treated by inserting an intramedullary Küntscher nail, rather than using a nail and plate. With a nail and plate it is important to use a long plate which will extend well below the fracture site.

6 fractures due to metastases and 1 due to a non-malignant lesion of the femoral neck and intertrochanteric region have been stabilised with a Smith-Petersen pin or with a nail and plate.

Good Functional Result

Case 4.—A woman, aged 50, admitted with pathological fracture of neck of femur two years after abdominoperineal resection of well-differentiated adenocarcinoma of colon. Insertion of a trifin nail was followed by course of radiotherapy. Walked well with crutches in two months. Last seen, alive and well, two years after fracture. Recent radiographs show calcification in tumour deposit, with incomplete healing of fracture.

Benign Lesion

Case 5.—A woman, aged 51, admitted with pathological fracture through benign cyst of neck of femur. Immediate reduction carried out and fracture stabilised with nail and plate. Ambulation delayed by postoperative thrombosis, but patient returned home to Nigeria four months after fracture, walking reasonably well.

SHAFT OF HUMERUS

A fractured humerus does not necessarily confine the patient to bed, but it may be extremely painful. Internal fixation can be achieved by means of a Rush pin or some similar device. As with the Küntscher nail, care must be taken to choose one of the correct length and diameter, and it must be inserted with particular care, since the thin bony cortex of the humerus is easily penetrated and re-fractured.

3 pathological fractures of the shaft of the humerus due to metastasis have been treated by the insertion of a Rush pin. Only 1 patient was confined to bed by the fracture, but in all cases the operation increased the patients' activities by reducing the pain.

Improved Fixation

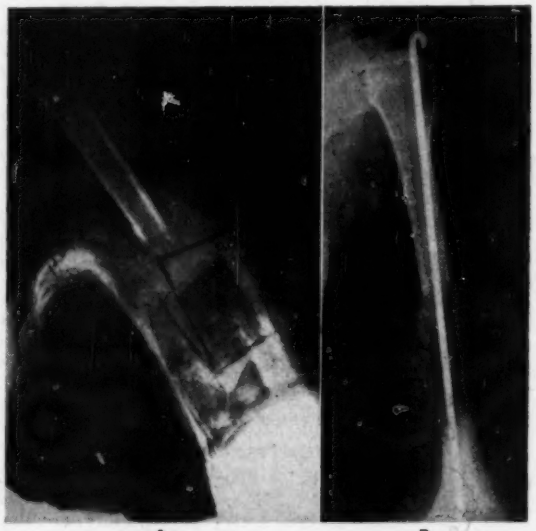
Case 6.—A man, aged 65, with pathological fracture of left humerus two months before admission. Treated elsewhere by immobilisation in plaster-cast, with poor fixation. Rush pin inserted at open operation, followed by course of radiotherapy (fig. 3). Histologically the tumour was a keratinising squamous-cell carcinoma. Readmitted four months after operation with severe dysphagia. Found to have a carcinoma of the œsophagus, which was treated by inserting a Souttar's tube. The Rush pin had slipped up about 2 cm., but there was still good fixation of the humerus.

Radiotherapy

The treatment of all pathological fractures through metastatic deposits should include radiotherapy. Even if the tumour is thought to be relatively radio-resistant, a high tumour dose can be delivered by the multiple ports around the limb circumference which are easily provided after internal fixation. This would be a difficult technical problem if the fracture were concealed behind the appliances necessary for immobilisation by conventional methods.

Unless internal fixation is undertaken prophylactically, or for the immobilisation of a solitary metastasis of extremely low-grade malignancy, X-ray therapy should be given after the operation. Delaying the reduction of the fracture will reduce the chance of a satisfactory mechanical result, and the danger of disseminating the disease by operating before irradiation need not be considered very seriously in the type of case that is usually considered for the procedure. The course of treatment should be started soon after internal fixation and should cover not only the fracture site but also the whole of the affected bone, since malignant cells will be carried in with the nail.

The presence of the metal pin in the treatment field is associated with certain theoretical disadvantages. Using 250 kV X rays, of about 1–2 mm. Cu. half-value layer, some shadowing will occur behind the pin owing to increased differential absorption in the metal. This will be largely obviated by application over two or more opposing fields. In any case the aim is not necessarily the complete destruction of every malignant cell in the



A B

Fig. 3—A, Pathological fracture of shaft of humerus through metastasis from carcinoma of œsophagus. Unsatisfactory position after external fixation. B, Satisfactory position after internal fixation.

affected area, but palliation before new metastases give rise to further symptoms. Secondary irradiation from the metal will lead to more intensive ionisation in cells in the immediate neighbourhood of the pin, but this again is of no practical importance. The tissue damage is too localised to give rise to any clinical effects. These theoretical objections could be avoided almost entirely by increasing the filtration of the X rays or preferably by using telecobalt therapy, or X rays in the range of 2–8 million volts (Wilson 1950).

The tumour dose required will depend on its radiosensitivity. If histological examination shows that it is anaplastic or from a primary growth that is radiosensitive, a dose of 2000–3000r over one to two weeks will suffice. If the metastasis is from a well-differentiated radio-resistant tumour, a higher dose may be necessary, delivered over a correspondingly greater time.

If the metastasis is from a hormone-dependent tumour, additional benefit may be obtained by the administration of testosterone and stilbœstrol or by hormone surgery. These measures will not only help the local fracture to heal, but may also postpone the appearance of metastases elsewhere.

Discussion

The results of internal fixation in this small series have been very satisfactory. In all cases there has been considerable or complete relief of pain, and some patients with widespread malignant disease have been able to resume an active life. Postoperative pain has always been easily controlled, and no patient has died as a result of the procedure. We believe that all pathological fractures of the long bones should be considered for operation.

The indications for the internal fixation of fractures through metastatic tumour deposits are as follows:

(1) When the fracture is painful or immobilises the patient.

(2) When external fixation is not as efficacious, or does not allow early ambulation. This refers particularly to fractures of the humerus and femur.

(3) When the malignancy of the tumour is such that widespread deposits can be assumed to be already present although they are not clinically apparent.

(4) When deposits are known to be present elsewhere.

(5) When the tumour is likely to be hormone-dependent. This provides an additional method of controlling any widespread deposits.

Prophylactic internal fixation is indicated where there is a real risk of fracture. It is worth while remembering that immediately after deep X-ray therapy to a metastatic tumour deposit, there is a period of increased risk of fracture, before calcification and healing finally occur.

Pathological fractures through bones involved in a benign process should be pinned if there is reason to believe that healing will be delayed, or if prolonged immobilisation is inadvisable.

Summary

The results of internal fixation in a series of 18 pathological fractures are described.

Internal fixation and radiotherapy have important parts to play in the management of pathological fractures.

We are very grateful to Mr. Philip Wiles, Mr. P. H. Newman, Prof. B. W. Windeyer, and Miss M. D. Snelling for permission to describe patients under their care, and to Mr. M. Turney for his assistance with the figures.

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INSULIN AND CHLORPROMAZINE IN SCHIZOPHRENIA

A COMPARATIVE STUDY IN PREVIOUSLY UNTREATED CASES

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ASSESSMENT of the efficacy of treatment in schizophrenia has presented difficulties for a variety of reasons. Strict objectivity in the description, diagnosis, and degree of recovery has not yet been attained; hence assessments by different psychiatrists and from different hospitals tend to be non-comparable. Similarly, most groups of schizophrenics treated by different therapies have not been contemporaneous or in strictly the same environment. Thus, insulin-treated groups have invariably been an élite, privileged by special supervision, staff, recreation, and diet, and usually biased in their mode of selection in regard to favourable prognosis. The nature and course of schizophrenic disorder are complex and variable, and earlier and milder cases tend to be admitted to mental hospitals for treatment thus introducing a proportion of cases that would have remitted spontaneously. Further, the periods of follow-up are not always comparable; and, as Rees (1949) has pointed out, the criteria of recovery are either not given or are expressed in various ways from discharge-rates to gradings of symptoms and signs or social behaviour.

Insulin, first introduced by Sakel in Vienna for the treatment of schizophrenia in 1935, has been widely adopted and proved of value even though it cannot be regarded as specific for this disorder. Major investigations, not always conforming to the above-mentioned desiderata of scientific method, have shown that insulin-coma treatment produces significantly better results than those obtained by routine hospital care, and that the remissions occur earlier and are of better quality and more lasting. These are to be found in publications of the Temporary Commission on State Hospital Problems (1944), Bond and Rivers (1944), Gralnick (1945), Freudenberg (1947), Mayer-Gross (1947), and Bond (1954).

Dissident voices have nevertheless been raised.

Libertson (1941) contrasted a group treated with insulin in 1937 with controls admitted simultaneously, and found that, by 1941, there was no difference in the results.

Roberts (1942) found no difference in outcome after two years, although temporary improvements were certainly commoner in the insulin group.

Rennie (1943) claimed that, in modern private hospitals, the results were little different whether schizophrenia was treated with or without insulin.

Gottlieb and Huston (1943) found no significant difference between two groups of schizophrenics, one treated with insulin and the other by psychotherapy, at the end of four years, and in 1951 they found no important difference even when early cases of acute onset were separately studied.

Penrose and Marr (1943), using an elegant actuarial technique in the Ontario State Hospitals, found that shock treatments produced few benefits in 1041 schizophrenics, and that, in these, convulsion therapy was more effective than insulin.

Feldman et al. (1947) noted a high readmission rate after insulin-coma treatment, with a continuance of social and economic problems.

Bourne (1953) finds that the evidence for the value of insulin treatment is unconvincing, and that the long-term prognosis is in no way influenced.

Kalinowsky and Hoch (1952), in their standard book on shock treatment, list a formidable number of contra-indications and complications. The contra-indications include active pulmonary tuberculosis, renal disease, liver disease, diabetes, thyroid and adrenal disorders, and most forms of cardiovascular disease. The complications are equally varied, insulin-coma treatment being a drastic procedure with a death-rate of 0·50–1·29%. They affect most systems, the most serious being prolonged coma, with an incidence of 2·7–30·1% (Freudenberg 1947). Such drawbacks in insulin therapy, coupled with the need to maintain specially organised teams of trained nurses, render the assessment of promising alternative treatments imperative and urgent.

The introduction of chlorpromazine into psychiatry was due to the work of Delay and his co-workers (Delay and Deniker 1952, 1953, Delay et al. 1952a–c, 1953). These investigators, though primarily interested in states of anxiety and agitation, considered that chlorpromazine influenced schizophrenic excitement favourably. Later Continental workers (Arnold et al. 1952, 1953, Sigwald and Bouttier 1953a and b, Staehelin and Kielholz 1953) agreed with Delay about the effect of chlorpromazine on schizophrenic excitement but considered it to be of symptomatic value only.

The general consensus of opinion in this country is that chlorpromazine is of great value in the symptomatic control of emotional and behaviour disorders in schizophrenia, but that it has no effect on the course or the content of the psychosis (Anton-Stephens 1954, Elkes and Elkes 1954, Charatan 1954, Baker 1955, Vaughan et al. 1955). Lomas (1955), however, dissenting from this general view, considered that, in some cases, particularly those of poor prognosis, the content of the psychosis might be altered and improvement continue after the withdrawal of chlorpromazine.

American investigators and a few Continental workers were very much more enthusiastic:

Kinross-Wright (1954, 1955a and b), Moyer et al. (1955), and Cohen (1955) all reported a high proportion of recoveries, particularly in the paranoid and catatonic groups.

Sainz (1955) considered that chlorpromazine had a specific action on the basic schizophrenic process; and Bird et al. (1955), in a preliminary report on 575 schizophrenics, mentioned that insulin and electroconvulsion therapy had been almost discontinued in a large mental hospital.

Meyer (1953) considered that chlorpromazine was preferable to both insulin and electroconvulsion therapy in catatonic and paranoid schizophrenia, and Labhardt (1954) concluded that chlorpromazine was the treatment of choice in both acute and chronic schizophrenia, and that it acted more intensively than any other form of treatment on the mechanism of schizophrenia.

With the notable exception of Labhardt (1954), however, the more enthusiastic writers make little attempt to define their criteria of improvement or to subdivide their cases into acute and chronic.

More detailed study of the reports of chlorpromazine in the treatment of schizophrenia shows that usually the more enthusiastic investigators use higher doses for a longer period of time than do those less favourably impressed.

Goldman (1955), in a detailed analysis of 317 schizophrenic patients, varied the dosage of chlorpromazine from 600 to 1800 mg. daily. He obtained much more favourable results in those treated for more than two months than in those where treatment was discontinued sooner. The difference was more pronounced in patients who had been in hospital for less than five years.

The complications of chlorpromazine treatment have been reviewed by Giacobini and Lassenius (1954) and Lomas et al. (1955). Deaths due to liver damage attributable to chlorpromazine have been reported (Deschamps 1952, Boardman 1954, Earle 1955, Isaacs et al. 1955), and Tasker (1955) reports a fatal case of agranulocytosis. Usually, however, the complications are less serious and the mortality much lower than with insulin therapy. Fatal jaundice can be avoided to a large extent if previous liver disease is regarded as a contra-indication to treatment, and agranulocytosis is an extremely rare complication.

A review of the literature on the treatment of schizophrenia by insulin and by chlorpromazine reveals a very considerable divergence of opinion about the efficacy of either method. It was the aim of the present investigation to compare the two methods in a controlled trial. Only the immediate results of treatment are assessed, but a prolonged follow-up of these cases is intended.

Method

Selection of Patients

All the patients who were included in the investigation were diagnosed as schizophrenics independently by two members of the senior staff. If either cast doubt on the diagnosis, the case was discarded from the series. Schizophrenia was defined as a condition in which associated disturbance in the affective, cognitive, and conative spheres led to incongruity or flattening of affect, thought disorder, and bizarrerie of conduct, and in which more florid symptoms—i.e., auditory hallucinations and delusional ideas—might also be present. Acute catatonic varieties, where emergency treatment might be indicated as a life-saving measure, and mixed schizo-affective states were excluded.

The difficulties in defining the duration of a mental illness are well known. It was therefore decided to include all newly admitted patients who had not previously been treated rather than to limit the series to those whose illness had lasted for less than some arbitrarily fixed time. A previous acute episode which had remitted spontaneously did not exclude a patient from the investigation, and a few patients had previously been in hospital for a short while but had left before treatment could be given. On the other hand, patients who had previously received chlorpromazine either from their general practitioner or as outpatients, for however short a time, were excluded.

After eligibility for the investigation had been decided, alternate admissions were allocated, separately for male and female patients, to the insulin and chlorpromazine groups. 5 patients were later removed from the series. 2 female patients on insulin refused treatment after one day and before starting treatment respectively, 2 female patients on chlorpromazine left hospital against advice after only three days' treatment, and 1 male patient developed jaundice attributed to chlorpromazine after two weeks' treatment. In addition, 3 patients left hospital against advice but returned shortly afterwards and resumed treatment where they left off. Results were assessed on the first 25 patients of each sex and in each group to complete an adequate course of treatment.

The mean age of the insulin group was 29·9 ± 0·8 (male 29·2 ± 1·3, female 30·6 ± 1), while that of the chlorpromazine group was 28·6 ± 0·7 (male 27·9 ± 1, female

TABLE I—DURATION OF ILLNESS

Duration of illness (mos.)	Insulin			Chlorpromazine		
	Male	Female	Total	Male	Female	Total
Less than 1 ..	2	6	8	6	7	13
2–6	10	5	15	5	3	8
7–12	5	1	6	6	4	10
More than 12 ..	8	13	21	8	11	19
Total ..	25	25	50	25	25	50

29·4 ± 0·9). The difference is therefore slight and not statistically significant.

No attempt was made to assess the exact duration of illness before treatment, but all the patients were classified into four groups by an independent assessor. The distribution is shown in table I.

It will be seen that the numbers under and over six months are almost identical in the two groups but there is a slight preponderance of very acute cases, with a duration of illness of less than 1 month in the chlorpromazine group. The difference in the distribution is not statistically significant ($\chi^2 = 4·5$ P = 0·25).

Method of Treatment

Insulin treatment was given by the regular visiting insulin therapist, a physician of wide experience in this form of treatment, who applied the same technique that he had perfected after many years at the hospital. This usually involved giving 50 comas, with additional electroplexy in appropriate cases.

Chlorpromazine was given initially in a routine dosage of 150 mg. daily, increasing rapidly to 300 mg., and continued for three months. In some cases administration was begun by intramuscular injection, but in the great majority the oral route was used throughout.

No rigid scheme was adhered to in either group, and variations in both dosage and duration of treatment were introduced when necessary. Environmental influences were kept as strictly equal as possible. Patients were treated in the same ward; so they were attended by the same doctors and nurses and received the same routine of diet, occupational therapy, and recreation.

Assessment of Results

Two different methods of assessment were used.

In the first method, *over-all assessment*, the patients were graded on the following 5-point scale immediately on cessation of treatment:

(1) *Not improved:* slight or no change either in symptoms or in behaviour.
(2) *Slightly improved:* decrease in symptoms and disappearance of gross behaviour disturbance.
(3) *Moderately improved:* improvement in adjustment at hospital level or to the outside world at a dependent level, shown by taking an interest in environment and in ward social activities and by employability within the hospital.
(4) *Much improved:* improvement in adjustment to the outside world at an independent level shown by increase in initiative, reliability, and responsibility.
(5) *Recovered:* symptom-free with insight and capacity for adjustment to the outside world at the level extant before the breakdown.

The assessment was made independently by the physician in charge of the two treatment wards (R. H. B.) and by one of us (M. M.) not having any continuous day-to-day contact with the patients. Of necessity R. H. B. knew the nature of the treatment each patient received but M. M. in most cases did not, although this again was unavoidable in some cases. Thus the former assessment was made with a more intimate knowledge of the patients and was in consequence probably more accurate, but the latter was less liable to influence by subjective bias.

In the second method a *symptom scale* was used. A 5-point assessment was made in each of four different fields of schizophrenic symptomatology as follows:

(1) *Florid symptoms*: delusions, hallucinations, &c.
Produced spontaneously =5
Elicited only on questioning =3
Absent =1

(2) *Conversation:*
Quite incoherent or mute =5
Displaying thought disorder or thought blocking =3
Rational and coherent =1

TABLE II—OVER-ALL ASSESSMENT

Assessment	Insulin			Chlorpromazine		
	Male	Female	Total	Male	Female	Total
Not improved	5	5	10	1	2	3
Slightly improved ..	2	6	8	6	3	9
Moderately improved ..	4	5	9	4	5	9
Much improved	8	2	10	7	4	11
Recovered	6	7	13	7	11	18
Total	25	25	50	25	25	50

(3) *Behaviour:*
Aggressive or impulsive =5
Actively uncoöperative and resistive =4
Passively uncoöperative but not resistive =3
Coöperative but apathetic and without initiative =2
Coöperative and with initiative =1

(4) *Accessibility:*
Quite inaccessible =5
Accessible to commands only =4
Accessible to commands and simple questions =3
Reasonably accessible to questions but without spontaneity =2
Fully accessible =1

Completely inaccessible patients were marked 5 for florid symptoms.

The total scale has therefore a range of 4–20 points, and a decrease denotes improvement. The assessment was made by R. H. B. at the beginning and end of treatment.

Results

Table II shows the distribution of patients in assessment groups. It will be seen that there is a difference in the distribution in favour of chlorpromazine, greater in female than in male patients, and that the difference is greatest at the two extremes in the numbers recovered or not improved. There is, however, no statistical significance in this difference ($\chi^2 = 4·7$ P = 0·3).

Table II shows the first assessment (R. H. B.), but agreement between the two assessments was very close. There was exact agreement in 72 cases, a difference of 1 point in 23, of 2 points in 4, and of 3 points in 1 case. Usually M. M. tended to downgrade compared with R. H. B. This led to the insulin patients receiving a total of 5 points less in his assessment, whereas chlorpromazine patients received 9 points less.

TABLE III—RESULTS IN SCHIZOPHRENIC SUBGROUPS

Assessment	Insulin					Chlorpromazine				
	Catatonic	Paranoid	Hebephrenic	Simplex	Total	Catatonic	Paranoid	Hebephrenic	Simplex	Total
Not improved ..	1	7	2	..	10	2	1	..	..	3
Slightly improved	5	1	2	..	8	4	4	..	1	9
Moderately improved	3	3	1	2	9	1	5	1	2	9
Much improved	4	4	1	1	10	5	5	1	..	11
Recovered ..	4	6	2	1	13	7	10	1	..	18
Total ..	17	21	8	4	50	19	25	3	3	50

Table III shows the distribution of results in diagnostic groups. It should be realised, of course, that these groups are very approximate, since all the patients were assigned to one or the other, although it is almost impossible to categorise some schizophrenics. The distribution is very similar to that shown in table II.

In each diagnostic group except simplex, where the total number is only 7, the results are slightly better for the chlorpromazine patients, but the difference is not statistically significant.

TABLE IV—ASSESSMENT BY POINT SCORE

Time of assessment	Insulin			Chlorpromazine			Significance		
	Male	Female	Total	Male	Female	Total	D	T	P
Before treatment ..	11·5 ±0·6	12·5 ±0·7	12 ±0·5	11·8 ±0·6	13 ±0·7	12·4 ±·5	0·4	0·62	0·74
After treatment ..	6·9 ±0·7	8·4 ±0·8	7·6 ±0·6	6·3 ±0·6	6·6 ±0·8	6·4 ±·5	1·2	1·62	0·97
Gain	4·6 ±0·8	4·1 ±0·9	4·4 ±0·6	5·5 ±0·7	6·4 ±0·8	6 ±·5	1·6	2·02	0·98

The results, assessed by difference in symptom-point score before and after treatment, are shown in table IV. There is an insignificant difference in the two scores before treatment started, but both the score at the end of treatment and the gain in points favour the chlorpromazine group, and these differences are significant at the 5% level. The four different types of symptoms on which points were given, however, are not independent of each other; therefore the significance of these results becomes less impressive.

The results of the investigation are based on assessment immediately on completing treatment, and no systematic follow-up study has yet been completed, but by the end of the trial 42 patients had been discharged after insulin treatment and 45 after chlorpromazine. The mean duration of the stay in hospital of the insulin patients was 24·2 ±1·9 weeks (male 24 ±2·6, female 24·5 ±2·9), the comparable figure for the chlorpromazine patients being 18 ±1·1 weeks (male 20·6 ±1·9, female 15·5 ±0·9). The difference of 6·2 weeks is significant at the 1% level. The difference is greater for the female patients, where it amounts to 9 weeks against the 3·4 weeks of the males.

This difference cannot be explained by any variation in the duration of treatment. The mean duration of treatment for the insulin group was 12·1 ±0·3 weeks and for the chlorpromazine group 11·7 ±0·3.

No account is taken of any subsequent treatment, but in both groups, if the result was unsatisfactory, further treatment of a different kind was given. The difference therefore suggests either that patients treated with chlorpromazine require a shorter period of convalescence or, where further treatment is needed, less time is required for this to take effect than where insulin is used initially. Duration of stay in hospital, however, is not a very reliable guide to the efficacy of treatment, because discharge depends on so many unrelated social factors, and the reasons for the difference will be analysed in greater detail in the follow-up study which is to be undertaken. At this stage it can only be regarded as suggestive.

Discussion and Conclusions

Assessment of improvement in mental patients is notoriously difficult. When the nature of the treatment given to two groups of patients is unknown, as in the double blind type of trial, a bias in favour of one group or the other can effectively be eliminated, but in this case such conditions were impossible from the nature of the two treatments. The results may therefore be suspect.

Chlorpromazine appears to be a more effective form of treatment than insulin, whichever of the two different methods of assessment is used, but the difference is slight and is not statistically significant. To offset this the insulin group is slightly less favourably placed prognostically when age and duration of illness are considered, but these differences are also statistically insignificant.

If duration of stay in hospital is taken into account, chlorpromazine has a distinct advantage over insulin, and the difference here is statistically significant at the 1% level. Although the limitations of using duration of stay in hospital as an indicator of the efficacy of treatment have already been mentioned, the difference cannot be disregarded.

There is, therefore, some evidence that chlorpromazine is a more effective method of treating schizophrenia than is insulin; and, although the evidence is very far from being conclusive, there is nothing at all in this investigation to show that insulin has any advantage. On the other hand, insulin therapy has many disadvantages. It is much more dangerous, even in the most expert hands; it is extremely unpleasant for patients and imposes more restrictions on their freedom, and it taxes the nurses more severely both in numbers and skill. It must, however, again be emphasised that results are based on the immediate effects of treatment, and an adequate follow-up study has yet to be conducted.

The results of this trial suggest that chlorpromazine is the treatment of first choice in schizophrenia, and that only when it has proved ineffective should recourse be had to insulin.

Summary

100 previously untreated schizophrenic patients (50 male and 50 female) were divided into two groups, of which one received insulin and the other chlorpromazine.

The insulin group was slightly less favourable prognostically, shown by age and duration of illness, than was the chlorpromazine group, but the difference is not significant statistically.

Results were slightly more favourable in the chlorpromazine group, judging by two different methods of assessment, but the difference is not statistically significant.

Patients receiving chlorpromazine remained in hospital on an average 6·2 weeks less than those on insulin therapy. This difference is significant at the 1% level.

There is inconclusive evidence that chlorpromazine has advantages over insulin in the treatment of schizophrenia, and that insulin has disadvantages in the form of greater danger and more unpleasantness for the patients and greater strain on the nurses.

Chlorpromazine is the first treatment of choice in schizophrenia, but this conclusion is based on the immediate results of treatment and has not yet been confirmed by an adequate follow-up study.

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EFFECTS OF INSULIN AFTER ADRENALECTOMY

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IT has generally been accepted, since the work of Cannon et al. (1924) and Houssay et al. (1924), that lowering of the blood-sugar level by insulin stimulates the sympathetic system and the adrenal glands. The consequent release of adrenaline, with rapid mobilisation of glucose from the liver, was thought to be responsible for restoring the blood-sugar levels to normal. This concept was supported by the increased sensitivity to insulin in animals after either denervation or removal of the adrenal glands (Cannon et al. 1924). In man the tachycardia and increased pulse-pressure associated with insulin hypoglycæmia were held to be further evidence of sympathetic stimulation and liberation of adrenaline.

Hexamethonium, given to produce ganglion blockade and to prevent the release of adrenaline, would be expected to potentiate the action of insulin; indeed this effect was reported in animals (Schachter 1951) and man (Laurence and Stacey 1952). Recent studies, using biological methods for the assay of adrenaline, provided further confirmation by demonstrating an increase in the catechol content of blood (Duner 1954, Holzbauer and Vogt 1954) and urine (von Euler and Luft 1952) during hypoglycæmia.

However, denervation of the adrenal glands does not prevent restoration of the blood-sugar level after the administration of insulin in animals (Berg and Zucker 1937) or man (Simeone and Vavoudes 1948, French and Kilpatrick 1955); and the results of studies on hepatic activity in man by venous catheterisation suggest that factors other than adrenaline and the sympathetic system may be important in restoring the blood-sugar level after hypoglycæmia (Bearn et al. 1952). Moreover the potentiation of hypoglycæmia by hexamethonium was not confirmed in man (Billington et al. 1954). Weil-Malherbe and Bone (1954), using a fluorimetric method to estimate adrenaline, claimed that plasma-adrenaline level actually fell during hypoglycæmia.

Adrenalectomy in man has now made it possible to investigate the effects of insulin in people who cannot increase their output of adrenaline.

Material and Methods

Twelve patients (nine women and three men) were admitted to hospital for adrenalectomy. The indications for operation were carcinomatosis secondary to carcinoma of the breast in the nine women, carcinoma of the prostate refractory to stilbœstrol in one man, and malignant hypertension in two men.

The tests were made soon after bilateral adrenalectomy—usually within three weeks of operation. In two patients the response to insulin was assessed before as well as after adrenalectomy. All the patients received postoperatively cortisone, in a maintenance dose of 25 mg. b.d. Food and fluids, apart from water, were withheld for 10–12 hours before the investigation.

After adequate control observations had been made, insulin was given intravenously in a standard dose of 0·1 unit per kg. of body-weight. Duplicate samples of 0·05 ml. of capillary blood were withdrawn from the ear initially in the control period and subsequently at 15, 30, 45, 60, and 90 minutes after the injection of insulin. In some of the patients a further specimen was taken at 120 minutes. Blood-sugar was estimated in these samples by a modification of the Shaffer-Hartmann method (Haslewood and Strookman 1939). Hand and forearm blood-flow were measured at intervals of $^1/_2$–2 minutes under standard laboratory conditions by venous occlusion plethysmography (Barcroft and Swan 1953) with metal plethysmographs filled with water. Detailed observations were made in all the patients for $1^1/_2$ hours after the injection of insulin, and in some of them for a further 30 minutes. At the end of the test the patients were given oral glucose as a precautionary measure before returning to the ward, but in no instance was there any reaction so severe as to make it necessary to terminate the investigation by giving intravenous glucose.

Results

Features of Typical Response

Some features of the response to insulin in a patient after adrenalectomy are illustrated in fig. 1. About 25 minutes after the injection the patient complained of sudden dizziness and slight sweating. At the same time the blood-flow in hand and forearm increased more than 100%. A short burst of hyperventilation lasting about 5 minutes was observed with the onset of symptoms. Sweating was profuse 35 minutes after the insulin and continued for a further half-hour.

The capillary blood-glucose level fell after the injection of insulin; the lowest level (29 mg. per 100 ml.) was recorded at 30 minutes and coincided approximately with the sudden increase in peripheral flow and with the onset of sweating. The blood-sugar level then began to rise; $1^1/_2$ hours after insulin had been given, the level was only slightly below its initial fasting value.

The maximal flow in hand and forearm was recorded about 30 minutes after insulin. Thereafter there was a slight decrease in mean flow, but at the end of the test, $1^3/_4$ hours after the administration of insulin, the volume of blood flowing through the hand and forearm was still far more than the initial amount.

Throughout the period of observation there was no appreciable change in either blood-pressure or pulse-rate. The oral temperature was unchanged for the first hour and then fell by 0·8°F. Apart from some tiredness no after-effects were experienced.

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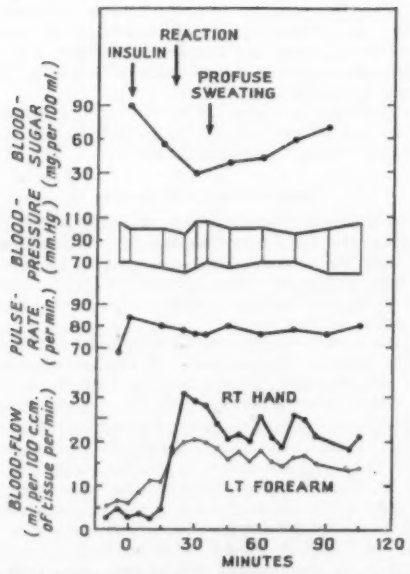

Fig. 1—Effect of intravenous insulin 0·1 unit per kg. of body-weight in female aged 45 (case 8) after adrenalectomy.

General Symptoms

In all the patients the onset of symptoms was abrupt, about 30–45 minutes after the injection of insulin. Individual responses are summarised in the accompanying table. Sweating, associated with a sensation of warmth, was observed in nine patients. Hyperventilation, coinciding with the onset of the reaction, was noted in five patients. This was a transient phenomenon lasting only 5–10 minutes except in case 4, who developed periodic respiration after the hyperpnœa and a tremor of the hand an hour after insulin. Some patients complained of a sense of apprehension; others became drowsy.

Blood-sugar

The levels of capillary blood-sugar during the first 2 hours after intravenous insulin in seven adrenalectomised patients are shown in fig. 2. The fasting value (plotted at 0 minutes) is the mean of two determinations in the control period differing only by about 6 mg. per 100 ml. The lowest point in the curve was usually reached at 30 minutes, with values ranging between 28 and 49 mg. per 100 ml. Subsequently the blood-sugar level rose to about the initial fasting level within 2 hours of the insulin. In the two patients in whom it was possible to investigate the effect of insulin before operation the blood-sugar curve was much the same after as before adrenalectomy.

Removal of the adrenals in man has therefore not altered the rate at which the blood-sugar level is restored after insulin hypoglycæmia.

BLOOD-PRESSURE AND PULSE-RATE OF PATIENTS GIVEN INSULIN AFTER BILATERAL ADRENALECTOMY

Case no.	Blood-pressure (mm. Hg) and pulse-rate at minutes after insulin				Remarks
	0	15	30	60	
1	185/120 (93)	170/115 (102)	155/110 (110)	150/100 (108)	Cold sweat; drowsy
2	135/95 (90)	150/95 (108)	150/95 (104)	130/85 (88)	No sweating; drowsy
3	130/80 (102)	130/70 (115)	130/70 (115)	130/75 (100)	Slight sweat
4	130/100 (84)	140/96 (86)	116/92 (86)	115/90 (78)	Marked sweat; tremor; hyperventilation
5	110/75 (64)	110/90 (72)	110/90 (78)	110/80 (68)	No sweating; slight hyperventilation
6	115/75 (96)	110/70 (112)	90/60 (104)	85/60 (96)	Hyperventilation; hot; no sweating
7	120/80 (120)	125/70 (124)	130/75 (122)	130/70 (118)	Slight sweat
8	105/70 (84)	100/65 (80)	105/65 (76)	100/70 (76)	Drowsy; profuse sweating
9	130/80 (82)	140/80 (84)	135/80 (82)	130/80 (92)	Hot sweat
10	130/90 (74)	130/90 (76)	130/85 (86)	125/80 (80)	Hyperventilation; slight hot sweat
11	125/90 (88)	125/95 (84)	120/90 (88)	115/95 (88)	Hyperventilation; slight sweat
12	110/70 (102)	100/70 (104)	105/70 (100)	100/75 (104)	Heavy sweat
"Average"	125/85 (90)	128/84 (96)	123/82 (96)	110/80 (91)	

Circulatory Changes in Hand and Forearm

The mean changes in hand and forearm flow are represented diagrammatically in fig. 3. The mean flow in hand or forearm was calculated at three stages: initially (before the injection of insulin), at the time of reaction (30–45 minutes after insulin), and an hour after insulin. Each mean value is based on eight to twelve measurements of flow taken during a 6-minute period.

In each case the blood-flow in the hand increased by at least 100% with the onset of the reaction. An hour after insulin the flow was still increased, though in a good proportion of cases it had subsided slightly. Initially (fig. 4) the flow averaged 5·7 ml. per 100 c.cm. of hand a minute in this group of patients. At the time of reaction there was a sudden increase in flow to a mean of 14·6 ml. An hour after insulin the blood-flow was still increased and averaged 13·7 ml. The increase in flow thus amounted to a mean increase of 140% above the resting flow.

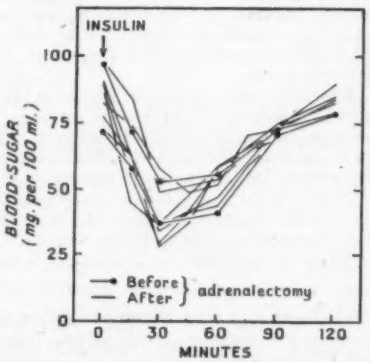

Fig. 2—Effect of intravenous insulin 0·1 unit per kg. of body-weight on capillary blood-sugar level in seven adrenalectomised patients and in two of these patients before adrenalectomy.

Usually increases in the blood-flow in the forearm ran parallel with those in the hand. The forearm blood-flow, in some cases, was even greater at 1 hour than at the time of reaction. The mean change in flow (fig. 4) was from the resting average of 3·4 ml. to 7·5 ml. at the time of reaction. Subsequently, an hour after the injection of insulin, the mean flow was 7·6 ml. The increase in forearm blood-flow therefore averaged 124%.

The onset of reaction, during insulin hypoglycæmia in the adrenalectomised patient, was thus associated with a doubled blood-flow in hand and forearm. This increase in peripheral flow was maintained for at least a further 30 minutes.

Blood-pressure and Pulse-rate

Slight changes only were recorded in blood-pressure and pulse-rate during the period of observation. Individual and "average" responses are summarised in the table. At the time of reaction there was generally a slight increase in pulse-rate, the "average" change being from 90 to 96. After an hour, when the blood-flow in forearm and hand was still increased, the pulse-rate remained unchanged. The pulse pressure fell slightly during the period of reaction, the "average" change being from 125/85 mm. Hg initially to 110/80 mm. Hg at the end of an hour.

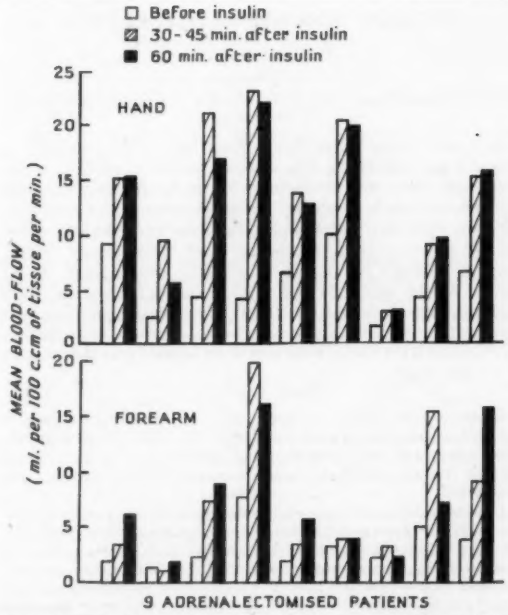

Fig. 3—Effect of intravenous insulin (0·1 unit per kg. of body-weight) on hand and forearm blood-flow in nine adrenalectomised patients.

Discussion

The essential difference between the adrenalectomised patient maintained on cortisone and the non-operated person may, for the purposes of this discussion, be considered in terms of their ability to release adrenaline during stress. Circulating adrenaline is largely derived from the adrenal glands: analysis of other tissues has shown that extramedullary sources account for rather less than 4% of the total amount of the hormone found in man (von Euler et al. 1954b). After bilateral adrenalectomy the urinary excretion of adrenaline is greatly reduced, whereas that of noradrenaline remains unchanged (von Euler et al. 1954a). There is probably some slight secretion of adrenaline even after adrenalectomy, but it is doubtful if additional supplies can readily be mobilised (von Euler 1954). It may therefore be assumed that after adrenalectomy man cannot increase his output of adrenaline. Thus differences in the response to insulin between adrenalectomised and non-operated persons may be related to the absence or presence of adrenaline. Conversely, when similar reactions are observed in the two groups, it may also be argued that these are not due to the release of adrenaline.

Control observations before adrenalectomy were unfortunately obtained in only two patients. In both cases, however, the rate of fall in the blood-glucose level and its subsequent return to normal were uninfluenced by the operation. Furthermore, the changes in blood-glucose level observed in this group of adrenalectomised patients were similar to those of a group of normal persons given equivalent amounts of insulin (A. Paton unpublished). Adrenalectomy in man has therefore not impaired the ability of the organism to restore circulating glucose after hypoglycæmia. Similarly, when sympathetic activity is reduced by ganglion blockage (Billington et al. 1954) or by surgical intervention (Simeone and Vavoudes 1948, French and Kilpatrick 1955), there is no delay in the rise of the blood-sugar level after hypoglycæmia.

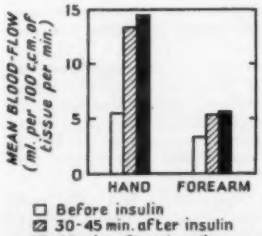

Fig. 4—Mean effect of insulin on hand and forearm blood-flow in nine adrenalectomised patients.

An increase in sympathetic activity and in the secretion of adrenaline cannot therefore be held responsible for the restoration of the blood-sugar level, and other factors must now be considered.

Corticosteroids are known to exert a profound influence on carbohydrate metabolism, and in Addison's disease the response to insulin is profoundly altered (Fraser et al. 1941). After adrenalectomy patients require cortisone (25 mg. b.d.) but obviously cannot themselves raise the blood-glucose level further. The rise in the blood-glucose level cannot therefore be due to an increased production of adrenal steroids.

A homœostatic action of the liver, regulating the blood-sugar level, has been suggested (Soskin et al. 1938) but not proved in man. In the present study adrenalectomised patients fasted for 10–12 hours, but maintenance cortisone was not withheld. It is therefore possible that liver glycogen was not reduced to very low levels, and that stimulation of the hepatic nerves might perhaps release glucose from this reserve. It was difficult to exclude such a mechanism in the adrenalectomised patient, since withdrawal of cortisone (which increases liver glycogen even during a prolonged fast) would not be justified. However, surgical interference with sympathetic activity does not prevent the return of the blood-sugar level to normal (Simeone and Vavoudes 1948, French and Kilpatrick 1955), and, when hexamethonium was given together with insulin, the hepatic output of glucose did not increase, and yet there was no delay in the return of the blood-sugar level to normal (Billington et al. 1954). Studies of hepatic activity in the adrenalectomised patient, comparable with those in healthy people and in diabetics (Bearn et al. 1952, Billington et al. 1954) might help to elucidate this problem.

A decrease in circulating glucose may stimulate the release of glucagon from the α-cells of the pancreas (Foa 1954, Foa and Galansino 1954). Glucagon has been shown to act directly on the liver (Pincus 1950) and to cause hyperglycæmia in man (Bondy and Cardillo 1956). However, its precise rôle in regulating the blood-sugar level in man has yet to be determined.

A central regulation of the blood sugar level has been presumed since the work of Claude Bernard (1849). Lesions of the brain-stem in animals (Anderson et al. 1952) and certain cerebral tumours in man (Paton and Petch 1954) have also been found to alter glucose tolerance. That a homœostatic mechanism could also act centrally and influence pituitary or pancreatic secretion is not unlikely.

The reaction to hypoglycæmia is associated with striking changes in the peripheral circulation. In the hand an increased flow is frequent (French and Kilpatrick 1955) though not invariable (Abramson et al. 1939, Allwood et al. 1956). The decrease in hand blood-flow found in a proportion of healthy people (Abramson et al. 1939, Allwood et al. 1956) may indeed be due to the release of adrenaline. This cannot, however, explain the striking increase in hand-blood flow which has been reported both in adrenalectomised and in non-operated persons and which must therefore be attributed to a decrease in nervous constrictor tone or to some other humoral agent.

The tachycardia and increase of pulse pressure in healthy adults in hypoglycæmia may reasonably be ascribed to the release of adrenaline. Indeed these effects are not observed after splanchnicectomy (French and

Kilpatrick 1955), after adrenalectomy, or when hexamethonium is given with insulin (Billington et al. 1954). That no great change took place in blood-pressure or pulse-rate in the adrenalectomised patients, despite the considerable increase in peripheral flow, must surely denote constriction in some other vascular bed, possibly in the splanchnic area.

The present study has therefore shown that factors other than the release of adrenaline determine the restoration of the normal blood-glucose level and the increase in peripheral flow associated with insulin hypoglycæmia.

Summary

The response to intravenous insulin 0·1 unit per kg. of body-weight was studied in twelve patients shortly after bilateral adrenalectomy.

Reactions to hypoglycæmia occurred at 30–45 minutes after the injection of insulin, corresponding approximately to the lowest level of capillary glucose. Sweating was observed in nine patients and hyperventilation in five. No great changes were recorded in blood-pressure or pulse-rate. The volume of blood flowing through the hand and forearm increased by more than 100% with the onset of reaction to hypoglycæmia. The increase in peripheral flow was maintained for a further 30–60 minutes.

In the adrenalectomised patient the blood-sugar level returned to the fasting value at the same rate as in healthy people or in the same person before operation.

It may therefore be concluded that adrenaline is not responsible for the restoration of the normal level of circulating glucose after insulin hypoglycæmia.

We thank all those who made this study possible: the patients for their coöperation during tests; Sir Stanford Cade, Mr. R. Cox, and the consultant staff of St. Thomas's Hospital for permission to study patients under their care; Prof. E. P. Sharpey-Schafer for the facilities provided in his department for some of our work; Prof. Henry Barcroft for his encouragement, advice, and valuable criticism; and Mr. G. T. Hales and Miss R. Palmer for technical assistance. Certain expenses were defrayed by a grant from the endowment fund of St. Thomas's Hospital.

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BENIGN ENCEPHALOMYELITIS

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SEVERAL cases have been described of an apparently new disease affecting the central nervous system. The two cases here reported resemble in many respects this type of encephalomyelitis. By publication of all available data on this entity, variously labelled encephalitis simulating poliomyelitis (Ramsay and O'Sullivan 1956), Iceland disease or Akureyri disease (Sigurdsson et al. 1950, White and Burtch 1954), and benign myalgic encephalomyelitis (*Lancet* 1956), a comprehensive picture will be formed leading to the establishment of a clinical pattern with its variations and thus possibly to elucidation of its ætiology.

Case-reports

Case 1.—A woman doctor, aged 27, developed a pain in the left sacro-iliac region on July 11, 1955. Next day the pain was worse, had become more generalised to involve the lumbar region, and was accompanied by vomiting and headache.

On examination two days later she gave a history of moderate anorexia for three weeks before her symptoms of low backache. She was admitted the same day and at that time was flushed and sweating, with temperature 99·2°F. She had some neck stiffness and a positive Kernig's sign. Her cerebrospinal fluid (C.S.F.) at this time showed no abnormality whatever (pressure 140 mm.; Queckenstedt's test, free rise and fall; protein 25 mg. per 100 ml.; sugar and chlorides normal in amount; Lange test normal).

Course of Illness.—The following day her headache, which was of generalised distribution, was more intense; she had photophobia and complained of pain in her left leg. Examination confirmed the meningism and revealed an area of hyperæsthesia in the territory of the left 10th, 11th, and 12th thoracic nerves. Two macules, each about the size of a sixpence, appeared on the patient's abdomen. Over the next two days the pain in her left leg increased, and the leg seemed to be weak, but her reflexes remained brisk and equal and the plantar reflexes were flexor. A second lumbar puncture on July 20 again produced C.S.F. normal in every respect.

On the 14th day she vomited profusely and her headache worsened. Her temperature which had never been completely normal, rose to 101·4°F. The following day she was transferred to the National Hospital, Queen Square, London, for further observation. At the end of a week there she improved to the extent of being able to walk about quite normally, although her temperature remained slightly raised. No organic cause was found for her condition, and she returned to Boscombe after two weeks.

Three days later her condition once again deteriorated. The main features were an occipital headache radiating bilaterally to the frontal regions and occurring at intervals of four or five days, with accompanying pyrexia occasionally as high as 103·5°F There was also frequent vomiting. Four weeks after the onset of symptoms she developed urinary retention and had to be catheterised frequently for three days, and two weeks later she had transient diplopia lasting four hours. Physical examination remained essentially negative, apart from possible weakness of the left quadriceps and dorsiflexors of the left foot. At no stage was there any lymphadenopathy. Lumbar puncture again produced normal C.S.F.

Because of the persistence of the symptoms the patient was once again investigated at the National Hospital, being readmitted there on Sept. 2. Repeated physical examinations showed no abnormal physical signs, although mild pyrexia persisted. It was thought that her clinical picture resembled that in outbreaks at the Royal Free Hospital that year. She was discharged home on Oct. 2.

She returned to work three weeks later, but after only three days again began to have headaches, vomiting, diplopia on looking to the left, and twenty-four hours later she developed frank retention of urine. She had a lateral nystagmus both to the left and the right, but physical examination was otherwise negative. Her urinary retention persisted for three

weeks, at the end of which time the bladder emptied only with the use of intramuscular carbachol. An intercurrent urinary infection developed which responded to streptomycin. She slowly improved and was finally discharged on Dec. 4.

Throughout the illness she was emotionally very labile, becoming more so as the illness progressed.

Special Investigations.—Her erythrocyte-sedimentation rate (E.S.R.) remained less than 9 mm. in one hour (Wintrobe). Peripheral blood contained an occasional Downey type of mononuclear cell, though repeated Paul-Bunnell tests were negative. An electro-encephalogram on Sept. 4 showed a rather low-voltage symmetrical tracing with normal alpha rhythm and some continuous theta activity, which was perhaps a little in excess of normal limits. The responses to flicker stimulation were symmetrical and of normal distribution. Inoculation of the C.S.F. intracerebrally into mice at the Virus Research Laboratory at Colindale gave negative results.

Follow-up.—When seen again in May, 1956, the patient was symptomless and able to continue her work satisfactorily.

Case 2.—A nurse, aged 26, on the staff of the Royal Victoria Hospital, Boscombe, reported sick on Oct. 24, 1955, with three days' history of painful red subcutaneous nodules on her legs and arms. She had no constitutional symptoms and, apart from the skin lesions, no abnormal physical signs. She was admitted for observation as a possible case of erythema nodosum. She had had rheumatoid arthritis in 1953, but it was now quiescent, and, in 1952, vague abdominal pains which remained undiagnosed in spite of extensive investigations, including cholecystography and barium-meal radiography.

Course of Illness.—Ten days after admission she began to have occipital headaches and giddiness on sitting up. During that day the headache worsened. Physical examination showed some neck stiffness, an injected throat, and the skin lesions, which by now had become vesicular. Lumbar puncture produced clear colourless C.S.F. under a pressure of 100 mm.; normal rise and fall on Queckenstedt's compression; two white cells per field; protein 25 mg. per 100 ml.; normal amounts of sugar and chlorides; Lange test 110000; Wassermann reaction negative.

Two days later she developed moderate lymph-gland enlargement in both anterior triangles and submandibular regions of the neck. The headaches continued, and there was now some accompanying vomiting and aching in the arms, legs, and shoulders. She had an occasional rise of temperature to 101°F, but for the most part this ranged between 98 and 99°F. On Oct. 31 (10th day of illness) she had difficulty in passing urine and this progressed to frank retention the following day, necessitating catheterisation for five days.

Two days after the onset of her symptoms she showed a non-sustained right ankle clonus, and the abdominal jerks, which up to then had been remarkably brisk, disappeared. Lumbar puncture again produced entirely normal C.S.F., except for a slight rise in the middle range of the Lange curve (012210). Intracerebral inoculation of mice at the Virology Institute, Colindale, with the C.S.F. gave negative results.

The illness pursued a relatively uneventful course until Dec. 9, when once again she had severe occipital and frontal headache and complete retention of urine. At this time she developed neck stiffness, a sustained left ankle clonus, and nystagmus both to the left and the right. Cervical lymph-adenopathy recurred. Lumbar puncture again produced entirely normal C.S.F. and on this occasion the Lange curve was flat. During the next week the patient's condition deteriorated, vomiting became profuse, and the headache was alleviated only by pethidine or physeptone. Tidal drainage led to *Escherichia coli* cystitis, which responded to streptomycin.

In view of the resemblance to case 1, a provisional diagnosis of "Royal Free disease" was made, and she was transferred to the National Hospital, Queen Square, on Dec. 16 under the care of Dr. E. A. Carmichael. Physical examination there was essentially as recorded above, but it was noted that the right corner of her mouth moved slightly less than the left, and there was thought to be a slight increase in the jerks on the right side. Her retention of urine cleared after a further two weeks, and the vomiting also settled down, although the headaches continued to be severe.

She returned to Bournemouth on Jan. 12, 1956, and appeared to be in complete remission but was still kept in bed until Jan. 13, when her headaches returned and she developed aching in the calves. Examination showed a sustained left ankle and bilateral patellar clonus. She again developed transient retention of urine for three days. After this episode she became symptomless, apart from slight colicky pain in the left side of the abdomen. All her physical signs became normal, and she was sent for convalescence on April 4 (nearly six months after the beginning of her illness), and when seen in May she was feeling well except for occasional mild headaches when feeling tired.

Throughout her illness her emotions were very labile, and both tears and laughter came easily to her.

Special Investigations.—Her E.S.R. throughout her illness remained above 34 mm. (minimum 34, maximum 40) in one hour, but this had been the order since 1953, when she had signs of rheumatoid arthritis. There was mild hypochromic anæmia (79% Sahli scale), which was treated with oral iron with good response. A Paul-Bunnell test was repeatedly negative, although an occasional atypical mononuclear cell was seen in the peripheral blood-film. An electro-encephalogram on Nov. 19 was abnormal in that it contained generalised slow activity of moderate or low voltage. An electro-encephalogram on Jan. 10 showed less slow activity but a distinct asymmetry of the alpha rhythm, better seen on the right than the left, with rather more slow activity on the left side, mainly in the temporal region.

Discussion

These two cases not only resemble one another closely but also in many respects those described by Ramsay and O'Sullivan (1956). The essential features are the duration of the illness, the dissociated neurological signs (meningism, nystagmus, retention of urine, and clonus), the accompanying changes of temperament, and the complete ultimate recovery. There appear to be no criteria of positive diagnosis from the laboratory point of view, although electromyography may be helpful (Ramsay and O'Sullivan 1956). Case 2 confirms the same observers' finding of an abnormal electro-encephalogram. The C.S.F., as in the previously published cases, was normal and served to distinguish the condition from poliomyelitis. Neither patient, so far as can be ascertained, had had direct contact with a case at the Royal Free Hospital. Contact between the two cases themselves was naturally possible in that they were working in the same hospital, although never in the same department. If case 2 was a contact of case 1, this suggests an incubation period of about three months, which does not agree with previous findings. It is not easy to see why there were no further cases in other contacts.

Difficulty in these types of cases has been found over nomenclature. In view of the length of the disease, the accompanying fluctuations of temperature, and the universally favourable outcome regarding mortality, the term "benign subacute encephalomyelitis" is suggested until a specific agent is isolated.

Summary

Two cases of atypical encephalomyelitis are described which came under observation in Boscombe in the latter half of 1955. It is suggested that the disease was closely allied to recent outbreaks at the Royal Free Hospital and elsewhere.

"Benign subacute encephalomyelitis" is suggested as a generic term for this group of diseases.

I wish to thank Dr. E. A Carmichael, of the National Hospital, Queen Square, London, Dr J. H. Bentley, and the late Dr. T. Robson for their help in the cases described; Dr. Carmichael and Dr. Bentley for permission to publish; Dr. S. G. Graveson for helpful criticism; and the Virus Laboratory, Colindale, for laboratory examinations.

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THE VALUE OF A CHEMICAL TEST FOR THE DETECTION OF BLOOD IN THE URINE DURING ANTICOAGULANT THERAPY

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ALTHOUGH the value of the coumarin group of anticoagulants is now generally accepted in the treatment of acute thromboembolic conditions, their long-continued prophylactic use is still largely experimental. Naturally there is some reluctance to treat outpatients with drugs an overdose of which may lead to serious hæmorrhage. Unfortunately even regular estimation of the plasma one-stage prothrombin-time is not always entirely reliable. Donald et al. (1954) showed that the onset of bleeding in these cases is occasionally associated with a true prothrombin deficiency detected only by a two-stage method. Indeed, it is possible that hæmorrhage may sometimes be due to capillary damage rather than to defects in blood coagulation.

As it is recognised that hæmaturia, especially the microscopic form, is the most common type of hæmorrhage caused by these drugs, it seems logical to examine the urine regularly for blood. This routine has the advantage of being independent of the actual mechanism of hæmorrhage. A search was therefore made for a chemical method which would detect small amounts of blood in the urine.

The Orthotolidine Test

According to Caplan and Discombe (1951) the most sensitive chemical test for occult hæmaturia is one based on the oxidation of orthotolidine hydrochloride. A convenient tablet test depending on this reaction has been prepared and will soon be available commercially.

The test is performed as follows:

One drop of urine (from a teated pipette) is placed on an inch square of filter paper and allowed to spread. A tablet is then placed on the centre of the paper and two drops of cold tap water are allowed to fall on to the tablet. A positive reaction is shown by the appearance of a blue ring on the paper around the tablet within the next two minutes. After this interval any colour appearing on the paper is disregarded. The test should be done on a clean surface.

The test was sensitive to a minimum concentration of 50 red cells per c.mm. of urine. A similar degree of sensitivity was recorded by Watson-Williams (1955). Pus gave negative results unless red cells were also present. It is important to avoid medicaments containing iodides, which can give false positives.

Application of the Test

The urine of 150 patients in hospital receiving anticoagulants, usually phenylindanedione, was examined daily for blood by the orthotolidine method. Red-cell counts of both non-centrifuged and centrifuged samples of these urine specimens were also made daily, using a Fuchs-Rosenthal hæmocytometer. At the same time, 30 outpatients receiving long-term treatment were taught to use the tablet test. They were instructed to test their urine every morning so that if a positive reaction developed they could attend hospital on the same day for a prothrombin-time estimation. In this way the correlation between the prothrombin-time and the presence of hæmaturia was assessed.

Most patients in hospital were treated with anticoagulants for one month; and all the outpatients were treated for at least a year. A satisfactory therapeutic prothrombin-time was considered to be about $2^1/_2$ times the control reading. In the estimation of the prothrombin-time, human brain was used as the source of thromboplastin.

Microscopic hæmaturia, as demonstrated by the orthotolidine test, occurred at least once in 18 inpatients and 6 outpatients, 1 of whom had more than one episode. The duration of this form of bleeding varied between twenty-four hours and five days.

It was found that the sudden appearance of occult blood in the urine, as detected by this test, was usually associated with very long prothrombin-times (i.e., greater than three times the control level) during the previous forty-eight hours or more; or it was a warning that the patient had developed a hæmorrhagic tendency in response to anticoagulant drugs and that further bleeding in the urinary tract or elsewhere was likely to follow within the next few days. For example, the 3 instances of macroscopic hæmaturia in this series were all preceded by occult hæmaturia, as demonstrated by the test, for at least twenty-four hours.

In this way, the discovery of a microscopic hæmaturia during anticoagulant therapy should make it possible to reduce the dose before more serious consequences develop.

Patients receiving anticoagulants for thromboembolic diseases sometimes have, in addition, other conditions, such as hypertension or congestive cardiac failure, which in themselves are often the cause of microscopic hæmaturia.

In 3 patients in this series a positive orthotolidine reaction was associated with other causes of hæmaturia. In 1 patient the hæmaturia was continuous during the month of treatment and was associated with long-standing hypertension. In the other 2 patients the hæmaturia was transient and was associated with intercurrent urinary infections. In these 2 cases the urinary symptoms and the presence of pyuria soon made the cause of the hæmaturia obvious.

The orthotolidine test was also useful in women before the menopause, except during menstruation. In practice, most women considered suitable for long-term treatment with anticoagulants have passed the menopause.

Unfortunately even routine examination of the urine for blood is not an infallible method of surveillance in these cases. Thus, prothrombin-times may sometimes be greatly prolonged without hæmaturia or any other form of bleeding. In this series prothrombin-times greater than three times the control level, lasting for periods of forty-eight hours or more, and unaccompanied by any form of hæmorrhage, occurred in 13 inpatients on 15 occasions. Similar increases in the prothrombin-time without hæmorrhage were noted in 3 outpatients, each on one occasion, during the course of one year. Furthermore, hæmaturia may be completely absent when there is hæmorrhage from other sites. These include the skin and subcutaneous tissues, the nose, the rectum, or any potentially hæmorrhagic lesion. Bleeding took place outside the urinary tract in 21 patients (15 inpatients and 6 outpatients) on 25 occasions. In most cases it was slight and it was never fatal. In 7 patients it was accompanied by microscopic hæmaturia.

The rationale and possible complications of anticoagulants should be fully explained to all outpatients receiving long-term treatment. Apart from regular visits to the hospital for prothrombin-time estimations they should report the development of any hæmorrhages. They soon develop a sensible attitude to these drugs and seem no more liable than diabetics to introspection because of daily urine testing.

Conclusion

Although regular one-stage prothrombin-time estimations remain essential in the control of anticoagulant therapy, daily examination of the urine for blood by the orthotolidine test is a useful additional safety measure, particularly for outpatients.

A detailed report of this work is in course of preparation; also some of the ætiological factors associated with hæmorrhage in these cases, and in particular the possible part played by capillary damage are being studied.

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Preliminary Communication

INHIBITION OF IODIDE-CONCENTRATING MECHANISM IN MAMMARY GLAND BY THIOCYANATE AND OTHER ANIONS

THIOCYANATE has been shown to lower the milk/plasma (M/P) concentration gradient for radio-iodide (^{131}I) in the conscious rabbit.[1] The mechanism of this action has now been studied in greater detail by the simultaneous collection of milk and plasma samples at intervals of 45–60 minutes for up to 6 hours after the subcutaneous injections of 10 μC. of carrier-free radio-iodide in lactating rabbits anæsthetised with sodium pentobarbitone.

Injection of 100 mg. of potassium thiocyanate reduced the M/P ratio from about 20 to 10 within an hour and eventually to unity. 10 mg. of potassium thiocyanate had a less pronounced but definite effect. The effect of injecting molar equivalents of other potassium salts was investigated in similar experiments, and their ability to affect the iodide-concentrating mechanism, judged by the rate of fall of the M/P ratio and the final level attained, was $ClO_4' > SCN' \geqq I' > IO_3' > NO_3'$. Potassium bromide and potassium chloride had no effect on the M/P ratio for ^{131}I at this dose level under the conditions of these experiments, although a slight rise in the chloride content of the milk was observed following the injection of potassium chloride. Methylthiouracil had no effect on the establishment of the M/P concentration gradient for ^{131}I.

The M/P ratio for thiocyanate was determined both in animals injected with potassium thiocyanate alone and in experiments in which the M/P ratio of ^{131}I was being studied and inhibition of iodide concentration was observed. The mean value of fifteen determinations at plasma levels of from 8 to 132 μg. potassium thiocyanate per ml. was $1{\cdot}04 \pm 0{\cdot}13$.

It would appear, then, that in its reaction to various anions the iodide-concentrating mechanism of the rabbit mammary gland is similar to that of the thyroid gland and of the salivary gland of most species.[2 3] An analogy has been suggested between the salivary and thyroidal "iodide traps."[3] If, in fact, these extrathyroidal iodide-concentrating mechanisms can safely be used as models of this particular aspect of thyroid function, then the mammary gland would appear to bear a closer resemblance to the thyroid than does the salivary gland. Thiocyanate blockade of iodide concentration by the breast occurs without significant concentration of the inhibiting anion, as in the thyroid, whereas this anion and possibly also the perchlorate anion are themselves concentrated in the saliva during iodide blockade.[3]

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Reviews of Books

Physics, Psychology and Medicine

A Methodological Essay. J. H. WOODGER, D.SC., professor of biology, University of London. London: Cambridge University Press. 1956. Pp. 145. 8*s.* 6*d.*

THAT a professor of biology in one of our leading medical schools should have attempted this "methodological" essay is in itself significant. Not only does he realise, more clearly than most preclinical teachers, that the great majority of an ordinary doctor's patients are suffering from disease at the mental rather than at the physical level, but he also recognises that the purely physicochemical approach, which attempts to explain all biological phenomena in terms of matter as at present understood, is unsatisfactory now and doomed to failure in the end.

From this starting-point he proceeds to a discussion of the scientific method and has much to say about the subject of scientific hypothesis. Too often, he maintains, the acceptance of a hypothesis, and the progressive explaining away of new observations which do not fit in with it, militates against the adoption of a better one which would explain a wider range of observations. Instead of regarding old hypotheses with minimum and new ones with maximum scepticism, we should adopt just the reverse attitude. It is of the old and well-tried that we should be the most suspicious. Do not let us always be trying to explain away new observations in terms of old theories. Rather let new observations give birth to new theories which will explain old observations better. Every science, Professor Woodger maintains, must remain autonomous in its own sphere and no one science has the right to claim to be the only one capable of explaining the observations of the rest, as physics and chemistry have done in the past. Rather, workers in different sciences must endeavour to learn each other's languages. Only by so doing can we ever develop a common language which will eventually describe, in relation to each other, the observed facts of physics, psychology, and medicine.

Thus, this little book widens out into a general discussion of causation, subjectivity, and objectivity, and the linguistic apparatus of modern psychology. It is true that it leads to no final conclusions, and, although clearly written, is not altogether easy reading. Nevertheless, the serious student and teacher, prepared to criticise our methods of attaining to knowledge, will find in it much to his educational advantage.

Ankylosing Spondylitis

Clinical Considerations, Roentgenology, Pathologic Anatomy, Treatment. J. FORESTIER, M.D., F.A.C.R. (hon.), and F. JACQUELINE, M.D., Aix-les-Bains; J. ROTES-QUEROL, M.D., Barcelona. Translator: A. U. DESJARDINS, M.S., F.A.C.P., F.A.C.R. Springfield, Ill.: Charles C. Thomas. Oxford: Blackwell Scientific Publications. 1956. Pp. 374. 81*s.*

THE original edition of this treatise, in French, was welcomed in these columns four years ago.[1] With minor changes and an extended bibliography, it now appears in an English translation.

The results of a long and careful study of a large number of cases are presented in leisurely detail; and the accompanying radiographs are comprehensive and excellently reproduced. The authors emphasise the existence of a definite symptomatology related to the well-recognised early radiographic changes in the sacro-iliac joints. The section on differential diagnosis includes a full clinical and radiographic description of the unfamiliar ankylosing disease of the spine of elderly patients, which the authors regard as a specific entity and which they have called "ankylosing vertebral hyperostosis of the aged."

As for treatment, the principles of basic orthopædic management are sound, and the main differences from the methods in current use in this country are found in sections on the use of thorium X, gold, copper, and amidopyrine.

The translation is generally unambiguous, although a good deal of French idiom is retained. Surgeons may dislike the term "bloody orthopædic operations," and physicians sympathise with the patient with a "rebellious pain" in his heel.

1. *Lancet*, 1952, i, 1145.

A short description of the sensitised-sheep-cell agglutination test is hard to follow and will doubtless be revised in future editions.

Modern Views on the Secretion of Urine

Cushny Memorial Lectures, edited by F. R. WINTON, M.D., D.SC., professor of pharmacology, University College, London. London: J. & A. Churchill. 1956. Pp. 292. 30*s*.

THIS book gives the substance of the ten Cushny lectures given at University College, London, in May of last year. All but two are by past or present members of the college, and the book is to that extent a posthumous *Festschrift* to a pioneer of renal physiology in this country.

In his foreword, Professor Winton lays his finger on the essential contribution of Cushny to nephrology—he stated his views in such a way that they permitted, and indeed invited, quantitative experiment and calculation. Much of present-day renal physiology stems from his famous monograph on *The Secretion of Urine* (1917, 1926), despite the fact that his denial of tubular secretion, and his affirmation of an ideal reabsorbate with the composition of normal protein-free plasma, are now entirely outdated. (Actually, one of the lectures is on the Process of Secretion, and several others imply the separate handling of urinary constituents.)

The subjects and lecturers were well chosen, and in addition to standard renal physiology (clearances, anti-diuretic-hormone action, and the like) there are rather less usual lectures on the process of secretion (L. E. Bayliss), genetic aspects of tubular function (H. Harris), and the first two days of life (R. A. McCance and E. M. Widdowson). Clinicians may find most to interest them in the reviews of the adrenal cortex and renal function (J. D. N. Nabarro) and functional aspects of renal failure (M. L. Rosenheim). The balanced tension in Cushny's own writings between describing how the kidney behaves and prescribing how it ought to behave is also visible in this memorial volume, with the clinicians on the whole occupying a behaviourist platform. This is a first-rate book for the honours student in physiology, for his tutors, for nephrophiles in general, and (as a work of reference) for "the general medical reader," if he still has time to exist.

Recent Advances in Pharmacology (2nd ed. London: J. & A. Churchill. 1956. Pp. 501. 40*s*.).—The second edition of this work by Prof. J. M. Robson and Prof. C. A. Keele will be greeted with satisfaction. It is virtually a new book, which summarises progress in 14 fields of pharmacology. There are new chapters on adrenaline and noradrenaline, hypotensive drugs, histamine and 5-hydroxytryptamine, chlorpromazine, aldosterone, the chemotherapy of tuberculosis and of the rheumatic diseases, nucleotoxic drugs and radiation hazards, and vitamin B_{12}. Part of the text of the first edition has been included after extensive revision. Each chapter gives a historical account of the introduction of a new drug and a systematic description of its properties and its place in therapy. The book will thus attract both pharmacologists and clinicians.

New Inventions

A PORTABLE LITHOTOMY FRAME

ONE of the difficulties of domiciliary obstetrics is to keep the patient in the required position. Though the left lateral position is preferable for the uncomplicated delivery and safer for general anæsthesia, the lithotomy position is the more convenient for pudendal-block anæsthesia and repair of the perineum. Hitherto there has not been any satisfactory portable contrivance (comparable to the lithotomy supports of the Chassar Moir labour-ward bed) for maintaining the labouring woman in this position. All too often the patient sinks into a pool of liquor in the bottom of the bed, while her attendants lean over her with aching backs.

I therefore decided to design a support which could be easily transported in a car and would fit any sort of bed. There are so many different sorts of beds that it is impossible to design a clamp which will fix on to the posts or rails, and if the woman lies along the length of the bed the foot-board gets in the way.

The lithotomy frame illustrated here avoids these difficulties. The vertical posts are fixed to a horizontal frame (fig. 1) which slips under the mattress (fig. 2), where it is held by the patient's weight. She lies across the bed with her buttocks at the edge of the mattress on one side; if the bed is narrow, her head is supported by a pillow on a chair at the other side. Canvas straps attached to hooks at the top of the posts support the patient's feet, and it is much more comfortable if her legs are brought inside the posts instead of outside, as is customary in hospital, with the patient anæsthetised.

The frame, made of tubular steel and aluminium sheet, is 2 ft. 6 in. high, 2 ft. 9 in. long, and 2 ft. wide. The vertical and horizontal portions come apart for transporting; and, folded flat, the frame does not occupy excessive space in a car; it fits into the boot of a 'Standard 8.' The model illustrated is the first to be made, and refinements are planned.

The lithotomy frame has been in use for a year; it enables a forceps delivery or repair of the perineum to be carried out conveniently and provides the operator with an adequate view of what he is doing. It fits any kind of bed. So far as the accoucheur is concerned, it takes the backache out of domiciliary obstetrics.

I am indebted to Mr. D. N. Struan Robertson for encouragement and advice, and to Mr. R. G. Mason, F.I.B.P., of Stoke Mandeville Hospital, for the photographs. The portable lithotomy frame was made for me by Thame Engineering (Oxon) Ltd., Haddenham, Bucks, who have applied for a patent.

R. P. C. HANDFIELD-JONES
B.M. Oxfd, M.R.C.P., D.OBST.
Haddenham, Bucks

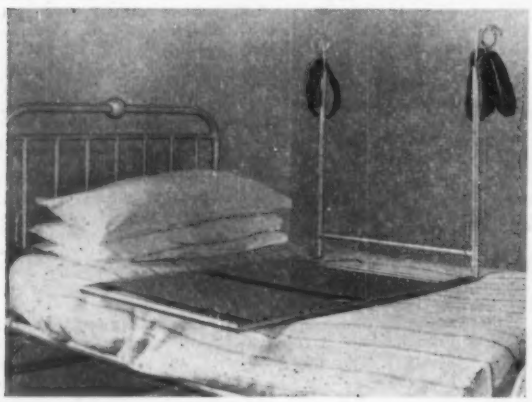
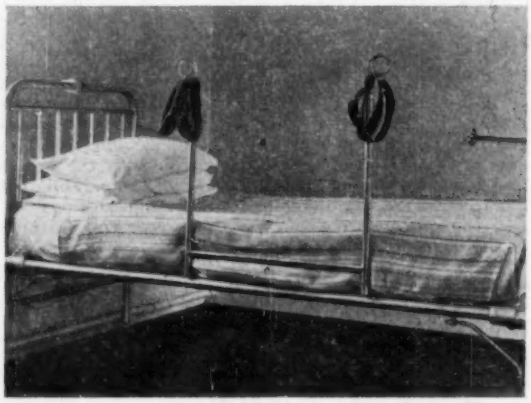


Fig. 1.



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THE LANCET
LONDON: SATURDAY, SEPT. 8, 1956

Sarcomas of Bone

Though EWING [1] compiled his first classification of malignant bone tumours as long ago as 1922, the subject is still confused by the lack of correlation between the clinical course, the histological structure, and the radiological appearances of the various types of growth; and, for that reason perhaps, clinicians, pathologists, and radiologists have failed to agree on a generally acceptable terminology. To overcome these difficulties some workers have adopted classifications of ever-increasing complexity. Despite CODMAN's initial misgivings [2] and KOLODNY's warning against the use of anatomical terms for pathological entities,[3] the bone-sarcoma registry of the American College of Surgeons has not only retained, through successive revisions, such groups as periosteal fibrosarcoma, solid medullary or subperiosteal sarcoma, and telangiectatic osteogenic sarcoma, but it added to them, in 1939, chondrosarcoma, the then recently described reticulosarcoma of bone, the malignant variety of giant-cell tumour, and the dubious liposarcoma.[4] Such arbitrary divisions, based on various clinical, histological, anatomical, and radiological criteria, became the source, with every new treatment, of unwarranted optimism or gloom, and prompted ROBB-SMITH's recent note of doubt about the reliability of statistical data based on registry material.[5] Guided more by the clinician's need for a reliable prognostic yardstick, other workers have tried to draft simpler classifications and define more clear-cut entities. In 1937 SCARFF [6] suggested that malignant bone tumours should be subdivided on the basis of their cellular structure alone; and rapid advances in the technique of identifying tumours histologically (the result of intensive research on both sides of the Atlantic [7–9]) have supported this view. In their analysis of 180 cases of primary bone sarcoma, seen at the Middlesex Hospital from 1925 to 1955, THOMSON and TURNER-WARWICK [10] have demonstrated the value of this method.

A fundamental point in dealing with all classifications based on cellular structure (there are a number of variations) is that the presence of bone in a tumour is not diagnostic of any one type. What is significant is not the presence of bone but the way it is formed: in other words, ossification in the stroma of the tumour does not necessarily indicate that the tumour is derived from osteoblasts, nor does the presence of cartilage or fibrous tissue rule out this possibility. THOMSON and TURNER-WARWICK described five groups of histologically and clinically distinct bone sarcomas. Ossification may be seen in any of them, but it is a function of the tumour cells in only one. Histologically, the first group (for which they suggest the name "osteosarcoma" or "osteoblast sarcoma," rather than "osteogenic sarcoma") is identified by the presence of irregular spicules of osteoid, surrounding, and actually laid down by, malignant osteoblasts. (Whether such a tumour falls into the osteolytic or osteosclerotic subgroup of GESCHICKTER and COPELAND [11] depends on the deposition of calcium in the osteoid matrix—a process which, according to THOMSON and TURNER-WARWICK, has no bearing on the diagnosis or prognosis.) In contrast to this osteoblastic group, ossification in the second and third group is an inconstant and "secondary" phenomenon. The diagnostic feature of the second group, the chondrosarcomas, is the presence of malignant chondroblasts which are capable of laying down cartilage: whereas in the third group, the fibrosarcomas of bone, the tumours "have one diagnostic feature, the formation of collagen by the tumour cells." Like many workers before them,[12–14] THOMSON and TURNER-WARWICK have found the outlook far better for patients with chondrosarcomas than for those with osteoblast sarcomas; the fibrosarcomas occupy an intermediate position. Two other types of primary skeletal sarcomas appear in THOMSON and TURNER-WARWICK's classification. In agreement with COLEY, LICHTENSTEIN, and JAFFE,[9 15 16] and contrary to BLOODGOOD's original assertion, they regard the giant-cell tumour of bone as far from benign. When its many "benign variants" (the chondroblastoma, the chondromyxoid fibroma, the aneurysmal bone cyst, the osteoid osteoma, and other less clearly defined tumours) are excluded, half the growths in this group recur after treatment; and a quarter of the patients die with metastases. Finally, 11 tumours in their series failed to produce a "diagnostic amount" of osteoid, cartilaginous, fibrous, or osteoclastic stroma; and, because they are very cellular, these are grouped under the fifth heading of "spindle-cell sarcomas."

The clinical value of such classifications turns on the question of how easy it is to distinguish, by means of biopsy, the various groups one from another—say, an osteoblast sarcoma with much cartilage from a chondrosarcoma with large islets of bone. Apart from their 11 cases of spindle-cell sarcoma, THOMSON and TURNER-WARWICK have had no difficulty in assigning the rest of their material to one of the four other groups; but many pathologists find the task of drawing dividing lines far more difficult. Another debatable point in the Middlesex Hospital series is the fact that the chondrosarcomas and fibrosarcomas seemed to have developed in pre-existing Paget's disease: such a sequence suggests a link, however obscure, with abnormal osteoblastic or osteoclastic activity rather than with chondroblastic or fibroblastic activity.

1. Ewing, J. *Arch. Surg.* 1922, **4**, 485.
2. Codman, E. A. *Amer. J. Roentgenol.* 1925, **14**, 105.
3. Kolodny, A. *Surg. Gynec. Obstet.* 1927, **44**, suppl. 1.
4. Ewing, J. *Ibid*, 1939, **68**, 971.
5. Robb-Smith, A. H. T. *J. Bone Jt Surg.* 1955, **37B**, 179.
6. Scarff, R. W. *Proc. R. Soc. Med.* 1937, **30**, 296.
7. MacDonald, L., Budd, J. W. *Surg. Gynec. Obstet.* 1943, **77**, 413.
8. Scarff, R. W. *Brit. J. Radiol.* 1947, **20**, 19.
9. Lichtenstein, L. Bone Tumours. London, 1952.
10. Thomson, A. D., Turner-Warwick, R. T. *J. Bone Jt Surg.* 1955, **37B**, 266.
11. Geschickter, C. F., Copeland, M. M. Tumours of Bone. Philadelphia, 1949.
12. Phemister, D. B. *Surg. Gynec. Obstet.* 1930, **50**, 216.
13. Platt, H. *Proc. R. Soc. Med.* 1932, **25**, 73.
14. Lichtenstein, L., Jaffe, H. L. *Amer. J. Path.* 1943, **19**, 533.
15. Coley, W. B. *Ann. Surg.* 1924, **79**, 321.
16. Jaffe, H. L., Lichtenstein, L., Portis, R. B. *Arch. Path.* 1940, **30**, 993.

Perhaps because it is so often hard to apply these pathological groups to clinical cases CADE,[17] in his review of 133 patients, dismisses them as "refinements in the pathologist's description of tumours . . . (that) are only histological variants of the same neoplasm which, by its nature . . . contains tissues encountered in varying stages of the normal development of bone." Such statements, however, may have led to confusion in the past. Fibrous tissue and cartilage are "stages" in the normal development of bone only in the sense that in certain parts of the body they may appear in succession and close together. Cartilage cannot develop from fibrous tissue: and bone can no more develop from cartilage than human beings can develop from apes. These tissues have a common cellular ancestor, but before bone can be laid down—whether in a tumour, in the embryo, or in the callus of fractures—cartilage must be destroyed by granulation tissue, and the highly specialised chondroblasts must be replaced by a distinct new set of equally specialised cells, the osteoblasts. CADE's acceptance of the "spindle-cell unit" as his sole diagnostic criterion makes his material heterogeneous; and his results with treatment by combined surgery and super-voltage irradiation must be viewed in this light. They are still impressive.

It is customary to refer to osteogenic sarcoma as radio-resistant. This is true for conventional X rays of about 250,000 volts, but it does not apply to super-voltage irradiation at 2–4 million volts (meV). WILSON [18] and SPIERS [19] have demonstrated that the energy of gamma rays and X rays generated at these high voltages is absorbed almost as much in soft tissues as in bone; and WOODARD and COLEY [20] have shown that bone sarcomas can be effectively controlled when a tissue dose of at least 6000r is delivered. During the years 1951–55 CADE treated 49 patients either with the 2 meV Van de Graff generator (21 patients) or with super-voltage irradiation followed by surgery (28). Clinically, most of the tumours regressed, and some completely disappeared; radiologically, active growth gave way to appearances characteristic of repair after injury; and histologically, tumours showed cellular changes similar to those which follow conventional irradiation of carcinoma of the breast and cervix. The tumour stroma was gradually replaced by scar tissue and occasionally by bone. 11 patients in the first group are alive and free from symptoms one to four years after treatment; and in the second group 11 patients are alive and well after one to four years and 5 after less than one year. Ill effects from radiation—telangiectases, intense fibrosis, atrophy of the normal cellular tissues, disappearance of fat, and endarteritis obliterans—are nearly always the result of some error in technique, especially too short an over-all time of treatment, too high a dosage-rate, or an attempt to achieve the necessary high tissue dose with conventional X rays. But when amputation is to be performed, such changes, even when they cannot be prevented, are of little importance. Preoperative radiotherapy necessarily delays amputation by a few months. During this time, some patients develop radiological evidence of pulmonary metastases; but CADE feels that urgent amputation would not have improved their chances and that, in fact, such a "natural selection" ensures that they are spared unnecessary mutilation and are given instead the full benefit of palliative irradiation. "Delay in amputation," he concludes, "does not seem to be as harmful in osteogenic sarcoma as in the common epithelial neoplasms of breast, stomach, tongue or uterus"; and the poor results obtained in large series of urgent amputations certainly bear this out.[21]

Sarcomas of bone are still amongst the deadliest of tumours, but there is certainly more hope today than when, not so long ago, a distinguished surgeon summed up a discussion on this subject thus: "If you operate they die; if you do not operate they die just the same—gentlemen, this meeting should be concluded with prayers."

17. Cade, S. *J. R. Coll. Surg. Edinb.* 1955, **1**, 2.
18. Wilson, C. W. *Brit. J. Radiol.* 1950, **23**, 92.
19. Spiers, F. W. *Ibid*, 1951, **24**, 365.
20. Woodard, H. Q., Coley, B. L. *Amer. J. Roentgenol.* 1947, **57**, 464.

Aluminium and Silicosis

OUR knowledge of the scope of the pneumoconioses has increased greatly in recent years [22]; but they still progress, albeit at different rates, to a fatal end by way of tuberculosis or right-sided heart-failure. Any means which prevents, retards, or possibly reverses this process demands full consideration; and the use of aluminium to arrest the development of silicosis comes into this category. The hypothesis advanced by HALDANE [23] that the dust of certain mineral rocks retarded the fibrosis caused by siliceous ducts gained some support from experiments by KETTLE,[24] who showed that the coating of particles of quartz by iron oxide rendered inert an otherwise active dust. Moreover, DENNY et al.[25] found that in rabbits the administration of 1% aluminium prevented the fibrosis produced by the quartz—a finding substantiated by others.[26] Unfortunately, in man, a fairly rapid diffuse fibrosis, often associated with spontaneous pneumothorax, was ascribed to metallic aluminium dust in ill-ventilated factories in the blackout in Germany [27]; after the war the condition was less prevalent and not so severe.[28] A similar fibrosis was described in Canada [29] in men exposed to fumes from heated bauxite: it was shown [30] that the fumes contained 30% silicon dioxide and 55% aluminium oxide and also [31] that the silicon particle size was 0·02–0·5 μ (a size smaller than that responsible for the classical silicotic nodules of fibrosis but larger than the particles which have a general toxic action). Thus, aluminium dust, under certain conditions of exposure, must be regarded as toxic. The conflicting experimental results with aluminium have been reviewed by KING

21. Ferguson, A. B. *J. Bone Jt Surg.* 1940, **22**, 916.
22. Meiklejohn, A. *Postgrad. med. J.* 1949, **25**, 599. Gough, J. *Ibid*, p. 611. Gough, J. *In* Recent Advances in Pathology. Edited by G. Hadfield. London, 1953; p. 218.
23. Haldane, J. S. *Trans. Inst. Min. Engrs, Lond.* 1918, **55**, 264.
24. Kettle, E. H. *J. Path. Bact.* 1932, **35**, 395.
25. Denny, J. J., Robson, W. D., Irwin, D. A. *Canad. med. Ass. J.* 1937, **37**, 1; *Ibid*, 1939, **40**, 213.
26. Gardner, L. U., Dwarski, M., Delahunt, A. B. *J. industr. Hyg.* 1944, **26**, 211. King, E. J., Wright, B. M., Ray, S. C., Harrison, C. V. *Brit. J. industr. Med.* 1950, **7**, 27. Harrison, C. V., Wright, B. M., King, E. J. *J. Path. Bact.* 1950, **62**, 443.
27. Goralewski, G. *Dtsch. TuberkBl.* 1943, **17**, 3.
28. van Marwyck, C., Eickhoff, W. *Arch. Hyg., Berl.* 1950, **133**, 139. Mödder, H., Schmitt, T. *Dtsch. med. Wschr.* 1951, **76**, 85.
29. Shaver, C. G., Riddell, A. R. *J. industr. Hyg.* 1947, **29**, 145. Shaver, C. G. *Radiology*, 1948, **50**, 760.
30. Pratt, P. C. Pneumoconiosis: 6th Saranac Symposium. Edited by A. J. Vorwald. New York, 1950. Quoted by Gough (ref. 1).
31. Hatch, T. F. *Ibid.*

and his colleagues,[32] and they showed that, in rats, the intratracheal injection of aluminium hydrate led to a severe and rapidly developing pulmonary fibrosis, at first as separate reticulated lesions, which became collagenous after 240 days and confluent within a year. The areas were not whorled as in silicosis. Aluminium phosphate produced a milder reaction which became collagenous more slowly over a year. Fumes from a corundum furnace produced an acute exudative reaction, and, if the animals survived, reticulated nodules were found round the dust, with little fibrosis. As KING et al. point out, their results were obtained with much larger doses of aluminium than are used in the prevention of silicosis.

There is much evidence from Canada and the United States,[33] sometimes cautiously favourable, sometimes unreservedly so, that small quantities of aluminium inhaled regularly will greatly retard, if not actually prevent, the development of silicosis in workers at risk. No adequate controls were included in these trials, and about the same time mechanical methods of dust control were also being more widely and efficiently applied. In a foundry manufacturing large castings, OSMOND [34] found that only 5% of 164 workers showed a falling off from normal respiratory function after six years during which they had inhalations of aluminium for five minutes a week. Moreover, only 9% of 125 workers with original functional incapacity deteriorated and 90% improved. PARKINSON [35] reviewed all cases of silicosis in the province of Ontario (mostly from the gold-mines) over a period of twenty years up to 1953 and found a striking improvement as time went by: he attributed much of this to the control and removal of dust and to improved ventilation, but he was satisfied that aluminium prophylaxis, administered generally since 1944, may have been at least partly responsible for the more rapid improvement since 1946. In this country, a trial of the prophylactic use of aluminium dust in the Cornish tin-mines, started by the M.R.C. in 1946, was not completed because of the difficulty of getting a satisfactory control group.

Though aluminium might, it seemed, prevent the development of fibrosis in silicosis, it could hardly be expected to reverse the process in the established disease. Nevertheless, any possibility that the metal had an as yet unexplained curative action in such a relentless disease seemed worth examination. BERRY [36] treated 26 silicotics with aluminium and 9 control silicotics with a placebo for twelve months; there was subjective improvement in both groups but no objective change in either group. An extensive trial, under the auspices of the M.R.C. Industrial Pulmonary Diseases Committee, has now been recorded by KENNEDY.[37] The aim was to assess the merits of aluminium inhalation in the treatment of established silicosis of pottery workers and pneumoconiosis of coalminers. 120 volunteers satisfied certain criteria (e.g., absence of detectable tuberculosis) and were paired as to age, sex, occupation, bronchospasm, pulmonary radiography, grade of dyspnœa, physiological assessment of ventilatory function, and time of starting treatment. All patients performed the physiological tests three times before treatment so that the "learning factor" (which possibly affected OSMOND's assessment of prophylaxis) would be eliminated; and they repeated the tests at intervals of six months. They were all given inhalations of compressed air only for six weeks before entering the trial proper. Then, to one of each pair, 50 mg. of pure metallic aluminium dust was given in fifteen minutes, three times per week: the other had 5 mg. of carbon black with 1 part per million of pure metallic aluminium (so little as to be an inert control). Most of the patients started together and the others joined in small batches over the next two years: the treatment was given over a period of three and a half years ending in November, 1952, so that those who started at the beginning and did not fall out received the largest number of treatments. Their condition was assessed each year up to five years. The results were unequivocal: there were no important differences in the behaviour of the two groups; in all the indices measured, there was little to choose between them. Neither treatment relieved bronchospasm: half the patients in each group claimed symptomatic improvement at nearly all stages of the investigation, but the same proportion said they were better after breathing air alone in the first six weeks. There was no regression of the radiological picture and no objective evidence of improvement in functional capacity. There was no evidence that the aluminium inhalation favoured the development of pulmonary tuberculosis. One point not made clear in the report was whether the pneumoconiosis in the 44 coalminers was of the simple type, in which HEPPLESTON [38] claims that the focal emphysema is a purely mechanical reaction round accumulations of dust without any silica, or whether the pneumoconiosis was accompanied by silicosis. There is no doubt, however, from the results in the pottery workers that treatment with aluminium powder in the doses tested has no effect on established silicosis. As with all other forms of pneumoconiosis, the ideal to be aimed at is complete suppression of the dusts.

32. King, E. J., Harrison, C. V., Mohanty, G. P., Nagelschmidt, G. *J. Pa...t. Bact.* 1955, **69**, 81.
33. Crombie, D. W., Blaisdell, J. L., MacPherson, G. *Canad. med. Ass. J.* 1944, **50**, 318. Hannon, J. W. G. *Trans. Canad. Min. Inst.* (*Inst. Min. Metall.*) 1944, **47**, 180. Bamberger, P. J. *Industr. Med.* 1945, **14**, 477. Johns, D. R., Petronella, S. J. *Mon. Bull. Ind. Bd Hlth.* 1945, **43**, 203. Rauschenbach, C. W., et al. *Industr. Med.* 1948, **17**, 1.
34. Osmond, L. H. *Arch. industr. Hlth*, 1955, **12**, 221.
35. Parkinson, N. F. *Ibid*, p. 56.
36. Berry, J. W. *Amer. Rev. Tuberc.* 1948, **57**, 557.
37. Kennedy, M. C. S. *Brit. J. industr. Med.* 1956, **13**, 85.
38. Heppleston, A. G. *J. Path. Bact.* 1947, **59**, 453; *Ibid*, 1953, **66**, 235; *Ibid*, 1954, **67**, 51.

"Operation Serenity"

THE island of Puerto Rico was formerly an unincorporated territory or possession of the United States, but in 1952 its $2^1/_4$ million inhabitants accepted a compact by which it became a new creation of the American system: no longer a dependency it has the status of "a free people associated to the United States on the basis of mutual consent and esteem." On receiving an honorary degree from Harvard last year, the governor of the new Commonwealth of Puerto Rico, LUIS MUÑOS MARIN, said some things about its progress that have a bearing on the future of other underdeveloped countries, and of developed ones too.

The Puerto Ricans, he said, have entrusted to their leaders three tasks, "each basic, all interrelated," to which he gave the military name of "operations." The first is to abolish poverty by increasing pro-

duction; and Operation Bootstrap—"a large effort with little means"—is expressing itself in dozens of new industrial activities, millions of kilowatt-hours, efficient airports, good roads and harbours, and better systems of marketing. The second is to work out a new form of human freedom; and the aim of Operation Commonwealth is to create a freedom "not of narrowness and isolation but of genuine brotherhood with free men everywhere." But it is the third task, which he calls Operation Serenity, that is the hardest; for its purpose is "to give some kind of effective command to the human spirit over the economic process."

"A society in which Operation Serenity had been successful," he said, "would use its economic power increasingly for the extension of freedom, of knowledge, and of the understanding imagination rather than for a rapid multiplication of goods, in hot pursuit of a still more vertiginous multiplication of wants. It is a basic duty, although clearly an insufficient one, to fight poverty. Priority obviously goes to fighting the old-fashioned poverty that consists of vast masses of people being ill fed, ill housed, ill clad, ignorant, insecure in illness, orphanhood, and old age: that is an undebatable common denominator of the social conscience. There is room also, it seems to me, for an awareness of a new-fangled poverty, that of the feverish desires outstripping the feverish production and of the feverish production inventing new desires that must go for many unfulfilled."

In the developed countries, Mr. MARIN pointed out, many goods are put forth on a deliberate principle of planned obsolescence, because the people have been persuaded to pay undue attention to changes in styles; and tribute is thus exacted from the public in a way more subtle than the State taxation against which they protest so much more often. He believes that in underdeveloped countries the chances of defeating poverty can be dramatically enhanced by working against it from both ends—by promoting not only efficient production but also rational consumption.

"Orientals and other peoples that are not economically advanced tend to pursue happiness by minimising desires; we Westerners tend to pursue it by increasing possessions, an unending way if it is viewed as a progression from the no-house family to the three-car family and beyond. The highly developed West has wonderful productive powers. . . . Obviously we are not going to scrap our wonderful machinery. We are going to keep on improving it. Why not use it to produce more wonders than gadgets, to extend freedom rather than to multiply the possibilities of insatisfaction; to extend educational opportunity and to deepen its reach till we have no man less understanding and less able than God meant him to be. Let the highly developed nations of the West help the underdeveloped areas of Asia, Latin America, Africa; help them to help themselves to defeat hunger, slums, evil living conditions; but let us not persuade them to scrap philosophies of good, decent, modest material desires. It is beyond the imagination what freedom and happiness great science can produce for a civilisation of fine modest wants."

Were the attitudes and habits associated with modern high productivity inexorably interwoven with the attitudes and manners of relentless material consumption? Mr. MARIN asked. Could a culture be efficient in production and at the same time wise and modest in consumption? Could it be feverish in output and serene in intake? "I say we are getting to the time in which it must—and if it must, it probably can." Economists were wrong in thinking that a higher and higher rate of multiple consumption is necessary to prevent the collapse of our economies, for it was clearly possible to re-gear high productivity to higher ends. If this were not so, it would certainly be time to ponder what to do about a situation in which serenity could bring about catastrophe.

"In the Declaration of Independence of the United States the young Republic was dedicated to the rights of life, liberty, and the pursuit of happiness. In Puerto Rico we are trying, in our modest setting, to bring to a harmonious success, for the good of our souls and bodies and for the observation of our fellow citizens and of such parts of the world as may care to look. Operation Bootstrap—the right to life; Operation Commonwealth—the right to liberty; and Operation Serenity—the pursuit of happiness with some hope of really catching up with her."

Annotations

NEW VIRUS VACCINES

THE viruses variously known as the A.P.C., R.I., A.R.D. group have lately been named adenoviruses by the two groups of workers concerned in their discovery. Three serological types—3, 4, and 7—have been implicated in epidemics of respiratory disease. Army, and to a lesser extent navy, recruits in the U.S.A. are particularly susceptible. In one inquiry, types 4 and 7 were responsible for up to 90% of respiratory disease in army recruits requiring hospital treatment.[2] At least some of the infections called A.R.D. have been shown to be due to type-4 adenovirus.[3] Type-3 virus has been implicated in civilian outbreaks of what is called pharyngoconjunctival fever.[4]

The prospect of using a vaccine against this group of viruses was raised by Huebner et al.[5] when they were able to protect volunteers against conjunctival challenge with type-3 virus, using an inactivated-virus vaccine. Service recruits are the obvious people to use in evaluating this vaccine, and two reports of vaccine trials in recruits have lately been published.

Hilleman et al.[6] used a laboratory-prepared vaccine containing virus of types 4 and 7. The strains were grown on monkey-kidney cultures and inactivated with formalin. In a controlled trial, 311 recruits were vaccinated and 313 were given a placebo. The vaccine was given just before an epidemic of respiratory disease due to adenovirus. The effect of vaccination was striking. Only 4·8% of those vaccinated, compared with 23·8% of unvaccinated, were admitted to hospital with respiratory infection in the period starting one week after vaccination.

A larger trial was organised by the U.S. Navy early this year.[7] In this trial commercially prepared vaccine was used. Type 3, 4, and 7 virus grown in monkey-kidney cultures were inactivated with formalin. The titre of virus used in this trial was higher, and the immunising capacity slightly better. 20% of recruits, selected at random, were given vaccine. Because type-4 adenovirus was found to be causing respiratory disease early in the trial, every tenth company of recruits was completely vaccinated. The preliminary report refers only to clinical illness. 1247 recruits were vaccinated and 4013 were unvaccinated. The incidence of rubella and non-febrile respiratory disease was very similar in both groups. On the other hand, the incidence of febrile respiratory disease was greatly reduced in the vaccinated group. Thus, from the third to the ninth weeks after

1. See *Lancet*, 1956, i, 844.
2. Hilleman, M. R. *Amer. J. Publ. Hlth*, 1955, **45**, 203.
3. Ginsberg, H. S., et al. *J. clin. Invest.* 1955, **34**, 820.
4. Bell, J. A., et al. *J. Amer. med. Ass.* 1955, **157**, 1083.
5. Huebner, R. J., Bell, J. A., Rowe, W. P., Ward, T. G., Suskind, R. G., Hartley, J. W., Paffenbarger, R. S. *Ibid*, 1955, **159**, 986.
6. Hilleman, M. R., et al. *Proc. Soc. exp. Biol., N.Y.* 1956, **92**, 377.
7. Bell, J. A., et al. *J. Amer. med. Ass.* 1956, **161**, 1521.

vaccination the proportion of hospital cases was 2% for the vaccinated and 5·7% for the controls. The low incidence of respiratory disease in the naval recruits was ascribed to penicillin prophylaxis, since the incidence of streptococcal infection was low. During a comparable period in 1954, when no penicillin was given, streptococci were isolated from 50% of cases of respiratory disease in the camp.

Influenza vaccine was also used in both the military and naval recruits. In the army study the group vaccinated against influenza received no adenovirus vaccine. They had a similar incidence of respiratory disease to the unvaccinated controls.

HÆMODIALYSIS FOR BARBITURATE POISONING

THE method of hæmodialysis offers a rational means of treating barbiturate intoxication by removing the poison from the body. Experimental work in dogs [1] showed that hæmodialysis could remove up to 40% of an ingested dose of phenobarbitone from the body, and rather smaller amounts of the shorter-acting barbiturates. Berman et al.[2] have successfully treated 8 patients with barbiturate poisoning by this method. An essential part of their régime is the repeated determination, by spectrophotometry, of the plasma level of barbiturate.[3] One of Berman et al.'s patients took the incredible quantity of 25 g. of phenobarbitone. When admitted to the special unit forty-nine hours later she was deeply comatose and had a blood-barbiturate level of 25·3 mg. per 100 ml. It is a testimony to this treatment that she recovered, for it is very unlikely that conventional methods could have saved her life. After six hours of dialysis the blood-barbiturate level fell to 11·4 mg. per 100 ml. and the patient recovered consciousness. But a further rise in the barbiturate level followed, and two more dialyses were required before recovery was complete. Other cases in this series show that dialysis can reduce the blood-level of barbiturates, and can hasten the return of consciousness, after poisoning by phenobarbitone, barbitone, amylobarbitone, and the short-acting barbiturates. Hæmodialysis was most effective after poisoning by phenobarbitone, and when the blood-level of the drug was high.

The technique of dialysis is complex, and not without hazards of its own; but results such as these suggest that it may come to have an important place in the treatment of severe barbiturate poisoning.

HUMANISTS AND SCIENTISTS

"PHILOSOPHY has tended to become a specialism among other specialisms, and many philosophers seem to be men who cultivate a particularly tidy way of talking about ways of talking." In Prof. James Drever's estimate, this is one of the reasons why the humanist argues against a scientific study of human behaviour and why he complains about the uses to which psychological knowledge has been put. It is not so much the presumption of science which offends him as the abdication of philosophy. Professor Drever was addressing the Sheffield meeting of the British Association last week. He pictured the humanist pointing resolutely back into the past: Plato may help here, Rousseau there. "Everything worth saying has already been said, and the aim of education is to teach the young where they may find it." But, Professor Drever observed, a man making contemporary decisions wanted contemporary guidance, and that was where scientists were apt to be forced into a position where they did not belong. The scientist could do rather well in dealing with means and consequences; perhaps he could give advice about ends as well. But in the latter field the scientist had no special credentials; and the humanist might be right to resent the undue consideration sometimes given to what his scientific colleague had to say on general matters. Professor Drever suggested that the remedy lay with the humanist himself. He should attempt to recapture the broad insight and speculative boldness of his predecessors. "He might not measure up to Plato, but at least he could do better than Monsieur Poujade or Joe McCarthy." The task of acquiring insight and speculative boldness was harder now than it had ever been, but it was also more important. If the humanist had something worth while to say, ordinary men would listen, but some of the others might be a trial. He must have an answer when the professional philosopher asked "Just what do you mean when you say that X is better than Y?"

CLOSURE OF WOUNDS

THE primary closure of skin wounds, whether surgical or traumatic, has interested surgeons for at least 35 centuries. During the long ages when no suture material was sterile and sepsis was inevitable, various attempts were made to close wounds without inserting stitches. The author of the Edwin Smith Papyrus, dealing with this subject in 1600 B.C. (or thereabouts), wrote: "If thou findest a wound open, thou shouldst draw together for him its gash with two strips of linen over that gash." An ingenious and less remote method, popular in the 19th century, was to transfix both wound margins by a straight needle, and hold the edges in contact by thread applied externally as a figure-of-eight.

Recently Gillman and his colleagues [1] have examined clinically and histologically the processes of primary healing, and, as a result, they became dissatisfied with the results of orthodox suturing. They found that the regenerating epithelium along the wound margins grew down towards the dermis, even when the wound was carefully sutured, and they regard this invasion of the dermis as "a consistent phenomenon in uncomplicated repair of cutaneous wounds." They also drew attention to the harm done by the actual stitches because of a similar epidermal downgrowth. Their tests on human volunteers involved making incised wounds on the forearm, where, incidentally, there is scanty subcutaneous tissue and skin margins are notoriously liable to invert.

Having convinced themselves that sutures are less efficient and more harmful than is generally believed, Gillman et al. adopted an alternative technique—the closure of incised wounds with narrow strips of adhesive plastic tape.[2] Pieces of ordinary stationery plastic tape are used, unsterilised. They are $2^1/_2$–3 in. long and $^1/_4$ in. wide, and they are applied with narrow gaps between them, the wound edges being squeezed together to give good apposition. Gillman et al. say that "speedier and much better apposition of incised edges" is achieved by this method, and they propose "discarding sutures entirely for skin closure whenever possible," even in major operations. Williamson [3] has also had very satisfactory results with a similar method.

Before these conclusions can be fully accepted, further research will clearly be needed. Comparisons will have to be made between the new method and the best efforts of skilled surgeons using orthodox techniques. Meanwhile, there remains for all surgeons an unaltered obligation to close wounds with such care that the result is, by the highest standards, inconspicuous and surgically sound. Fashions will change, but at present there is no better routine method of proven value than to use the

1. Sunshine, I., Leonards, J. R. *Proc. Soc. exp. Biol., N.Y.* 1954, **86**, 638.
2. Berman, L. B., Jeghers, H. J., Schreiner, G. E., Pallotta, A. J. *J. Amer. med. Ass.* 1956, **161**, 820.
3. Goldbaum, L. R. *Analyt. Chem.* 1952, **24**, 1604.

1. Gillman, T., Penn, J., Bronks, D., Roux, M. *Brit. J. Surg.* 1955, **43**, 141. Gillman, T., Penn, J. *Medical Proceedings (Johannesburg)*, 1956, **2**, 93.
2. Gillman, T., Penn, J., Bronks, D., Roux, M. *Lancet*, 1955, **ii**, 945.
3. Williamson, P. *Ibid*, 1956, **i**, 206.

finest needles and suture materials; to insert if necessary as many as eight stitches to the inch; and to achieve proper eversion without too much tension. In certain areas, such as forehead, eyelids, or neck, subcuticular sutures of wire or other material may give better results, since there is no need for early removal to avoid stitch marks. All these methods take time, but it would be a pity if any well-tried technique, widely applicable and highly reliable, was discarded because it made considerable demands on a surgeon's patience or craftsmanship.

CHOLECYSTANGIOGRAPHY

EXPERIENCE in the use of the intravenous contrast medium, sodium iodipamide ('Biligrafin,' 'Cholografin'), for the display of the biliary tract has been accumulating in the past three years, and clearer ideas of its uses and value are beginning to emerge. For the demonstration of the gall-bladder it is obviously superior to media given by mouth when the patient is vomiting or when absorption is impaired by diarrhœa; and it has another clear advantage when an early answer is wanted, as in acute abdominal conditions. On the other hand, though no deaths have been reported after its use, it has given rise to severe reactions.[1–5] Moreover, it is a more time-consuming and troublesome procedure for the radiologist and his staff; and it also has the theoretical disadvantage that it is concentrated in the liver, thus giving poorer evidence of gall-bladder function than the oral media, which are largely concentrated in the gall-bladder itself. It seems undesirable, therefore, to use biligrafin when oral media will suffice.

Most authors agree that in the routine investigation of the gall-bladder, oral cholecystography is still the method of first choice, and that intravenous cholecystography should follow only when there are clear indications for it. It is not indicated after a normal oral cholecystogram, which practically excludes gall-bladder disease,[6] unless the particular aim is to exclude a common-duct stone; nor is it indicated by the finding of gall-stones, again unless it is important to examine the common duct for stones. It *is* indicated, however, when the findings of oral cholecystography are equivocal (and that includes a shadow of poor density) and when there is complete absence of filling. In that case, biligrafin may conclusively demonstrate gall-stones, or it may show the bile ducts without gall-bladder filling—a finding which reinforces the evidence of gall-bladder disease and which is often, though not invariably, associated with stones in the cystic duct.[7] Occasionally, a gall-bladder which is not filled by oral cholecystography fills normally with biligrafin: it is certainly not safe to assume from this ambiguous result that the gall-bladder is normal, because Jordan [8] has recorded 4 such instances in which cholecystitis was found at operation.

In the investigation of the postcholecystectomy patient, however, biligrafin seems the best agent, even though Twiss and his colleagues [9] have shown that oral media can be used. In the so-called "postcholecystectomy syndrome" intravenous cholangiography can sometimes be decisive, by demonstrating stones in the common duct or in a cystic-duct remnant; but such clear-cut findings are rare. Usually the biliary system looks normal or shows an abnormality of doubtful significance, such as a cystic-duct stump without stones. There is both clinical and pathological evidence [10 11] that these remnants are almost always accompanied by inflammation and that their removal is beneficial. On the other hand, McClenahan and his colleagues [12] found cystic-duct remnants nearly twice as often in a control series of symptom-free patients as in a group with postcholecystectomy pain.

Similarly open to dispute is the significance of dilatation of the bile-ducts. Since the early work by Oddi on dogs, it has been held that the bile-ducts undergo a sort of postoperative physiological dilatation; but if the maximum diameter of the normal duct (as measured on the radiographs) is accepted as 8 mm.,[13 14] the duct is, in most cases, not abnormally dilated after cholecystectomy. Twiss et al.[9] consider that dilatation, when present, is evidence not of physiological dilatation but of "biliary dyskinesia"; Shehadi's view [15] is that the usual cause is stenosis or fibrosis of the sphincter of Oddi; and Wise and O'Brien [7] believe that dilatation indicates partial obstruction, but only when the diameter exceeds 15 mm. On the other hand, Don and Campbell [16] hold that all that can be inferred from dilatation is that the duct has been obstructed at some stage, usually in the past and by a stone, and that the dilatation has proved irreversible. They found dilated ducts just as commonly in symptom-free postcholecystectomy patients as in those with symptoms, and they conclude that this finding in the postcholecystectomy syndrome is of no significance. McClenahan et al.[12] found a similar incidence of dilated ducts in symptom-free patients compared with those who had pain.

Stasis in the bile-ducts, measured either by the time after injection at which the opaque medium starts to enter the duodenum or by fading of the bile-duct shadow, also seems of doubtful significance in the postcholecystectomy syndrome, for wide variations in these times are found in patients both with and without symptoms.

Biligrafin provides a rough index of liver function,[17] but this is seldom of practical value. With normal liver function, the biliary tract will sometimes fail to opacify, although that is exceptional. With some reduction in liver function, opacification is often impaired; and with severe liver damage the biliary tract can seldom be seen. When there is jaundice due to obstruction or liver damage, biligrafin is rarely successful in outlining the ducts, and so it is of little value in the differential diagnosis until the jaundice has cleared. In this respect biligrafin forte (methyl glucamine iodipamide in 50% solution), which has been recently introduced,[18] promises better results [19]; but even so it seems unlikely to be of value in most jaundiced patients.

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Special Articles

COMMONWEALTH SURGERY IN THE KOREAN WAR

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THE fundamental precepts of British war surgery are laid down in the excellent official manual, *Field Surgery Pocket-Book*. In any war these precepts must be modified by such things as geography and movement; but in the Korean war they were further conditioned by the fact that the Commonwealth forces were fighting as part of an American army and that all the forward surgery had been done by our American and Norwegian colleagues, while British Commonwealth surgeons were responsible for the closure of wounds and definitive surgery.

From the surgical as well as the military point of view, the Korean war can be divided into three main phases. First, there was the period of desperate defensive fighting by a few ill-supported battalions, and an account of surgery at that time has been given by Latta (1951). Then came the phase of rapid advances and retreats and much hand-to-hand fighting with small arms, as described by Davis (1952). Finally, came the long war of attrition along the 38th parallel when the gunner came into his own and conditions were reminiscent of the Western Front in 1916—the period this article reviews.

Evacuation of Casualties

As a result of experience in two major wars the British policy for battle casualties is that a wounded man should be got as quickly as possible to a surgical unit (casualty-clearing station), so that the initial cleaning and debridement of his wounds can be done within six hours of wounding. After this he is evacuated to a general hospital where his wounds are closed between the fourth and sixth days.

In the Korean war the British Commonwealth Forces consisted of one infantry division with a very light supply tail in Korea itself and a reinforcement and supply base at Kure in Japan. In battle the division was part of the 1st American Army Corps and so had to fit in with the American Corps medical arrangements.

When a man was wounded he was evacuated through the divisional field ambulances to a mobile army surgical hospital (M.A.S.H.) in the usual way, after resuscitation if necessary. Urgent cases were evacuated directly to the M.A.S.H. by helicopters, which the medical officer in a C.C.P. could call up at fifteen minutes' notice during daylight. The patient on his stretcher was placed in a "pod" on the side of the fuselage. There is no doubt that many lives were saved by these helicopters and they should be used in future fighting whenever possible.

The American M.A.S.H. is a unit designed purely for forward initial surgery and consists of a reception and preoperative ward, and operating-theatre with four or more tables, a post-operative recovery ward, and a small holding ward. Four surgical teams are constantly on duty. On arrival the case is seen and assessed in the reception ward, radiographs are taken and transfusion either continued or started. The patient then receives treatment in the theatre, as soon as a table becomes available, and is taken from there to the post-operative ward where he stays until the next morning. In the morning all postoperative patients are seen by the senior surgeon, and all who are fit to travel are sent by ambulance train to an evacuation hospital. Abdominal and other cases unfit to travel are transferred to the holding ward.

Commonwealth Division casualties were taken from the ambulance train in Seoul and put into a small Commonwealth Hospital with a Royal Australian Air Force air-evacuation section attached. Here again the patient was held for from one to several days depending on the make-up of plane-loads, the number of aircraft available, and the weather. He was then flown to Iwakuni in Japan where, after a few hours delay, he had another three hours by ambulance-train to Kure, arriving at Britcom General Hospital in the evening after a long and exhausting journey. After a night's rest he then went to the theatre for delayed primary suture and other necessary surgery.

Up to the M.A.S.H., evacuation was rapid and the initial surgery was usually carried out well within the accepted time limits. After leaving the M.A.S.H. the picture was rather different, and a third of the casualties took six or more days to reach secondary surgery while a further third took five days. Among the patients who took six or more days to reach Kure sepsis was more prevalent, and it would have been better if the hospital had been in Korea rather than in Japan. This, however, was not possible for a number of reasons.

Early Treatment of the Wounded

The treatment of the wounded man in this campaign conformed closely to the British procedure in the late war. The forward surgery was carried out in American and Norwegian units (to which all Commonwealth surgeons were temporarily attached for experience) and the secondary surgery in the British Commonwealth General Hospital at Kure in Japan. This hospital was unique in that it was staffed by the combined Army Medical Services of Britain, Australia, and Canada, and the three groups of medical and nursing personnel were completely integrated.

In civil surgery one surgeon is responsible for a patient throughout his illness, and can carry through his own preferred method to its conclusion, but in military war surgery the necessity for evacuation makes the patient the responsibility of a series of surgeons. It is therefore essential that someone should lay down a standard line of treatment, and that this should be strictly adhered to. To ensure this in Korea the Surgeon of the 8th United States Army, in November, 1952, laid down a standard operative procedure for forward surgeons. This conformed to the accepted British practice apart from minor details and the few instances—such as amputation and splinting—which I shall discuss later.

When a soldier is wounded he might not be killed outright, but he might die within a few hours from shock and hæmorrhage, or later still from urinary suppression, infection, or other complications. The object of military surgery is to save him and to prevent or minimise ultimate disability.

All battle wounds must by their nature be contaminated, and it was found in Korea that in 100 patients examined three and a half hours after wounding clostridia were present in two-thirds, and *Clostridia perfringens* in one-third. Despite this, gas gangrene was practically unknown and infection severe enough to endanger life was rare (Dorney 1953). This can be attributed to the early use of anti-tetanus serum and penicillin—of which an initial dose of 300,000 units was given—in the regimental aid-post (R.A.P.) or field ambulance, and to early surgical treatment at the M.A.S.H. This essentially consists of the excision of contaminated and devitalised skin edges, the opening up of fascial planes with relief of tension, and the ruthless removal of all dirt, cloth, foreign bodies, and devitalised tissue—the procedure commonly referred to as debridement. The more experienced a surgeon is the more radical his debridement, and the better his results. So true is this that working in a base hospital one can spot the arrival of a new surgeon or an inexperienced unit by the immediate deterioration in the condition of wounds. From an expert forward surgeon one gets a large open wound which looks red and healthy, and which can be closed at once, while from the tyro

the wounds are smaller and contain masses of slough and pockets of pus.

HÆMORRHAGE AND SHOCK

The most easily available guide to shock is the blood-pressure, which reflects the reaction of the autonomic system to a decrease in the circulating blood volume. In the early stages this reaction is an attempt to compensate by vasoconstriction; and this vasoconstriction—associated with a diminished circulating volume—can give rise to three separate clinical syndromes. All three must be recognised, for they require different treatment. They are:

(1) Hypertensive response.
(2) Compensation.
(3) Decompensation (Grant 1947).

(1) When there has been a moderate loss of blood there is sometimes a steep rise in blood-pressure (to 160 mm. Hg or higher), which is said to be due to an excessive production of noradrenaline. This often masks a tendency to the sudden onset of obvious shock, and this complication is apt to follow an anæsthetic. Such cases must therefore be watched carefully and blood or plasma expander given as soon as a drop in pressure is evident. Even in cases which never show frank shock there is a delayed danger of anuria, probably because of spasm of the afferent arterioles to the glomeruli.

(2) In cases with a moderate loss of blood (up to 25% of the circulatory blood volume) this vasoconstrictor response might keep the blood-pressure within normal limits, although associated with other signs of shock, such as an increased pulse-rate and deepened respirations. This is the "compensated" type; and it is dangerous because the compensating vasoconstriction is apt to subside suddenly, anæsthesia being again particularly liable to be responsible for this. This type should be treated by blood replacement even in patients with normal blood-pressure.

(3) When the loss of circulating blood volume is more than 25%, the blood-pressure falls. This state of "decompensation" may be seen early from massive blood-loss; or it can come on later, either as a complication of the hypertensive or compensated types; or as a result of continued blood or plasma loss. Another possible cause is long-continued anæmia-anoxia of the vital centres. These cases must have blood urgently and plentifully to prepare them for anæsthesia. Provided that blood-loss is not continuing, and that there is no damage to the central nervous system, it is usually possible to raise the blood-pressure if sufficient blood is given, even in patients without measurable blood-pressure. The blood must be given urgently since prolonged hypotension and cerebral anoxia will ultimately lead to irreversible shock, in which the vasoconstrictor mechanism has failed from anoxia, and the heart cannot respond to filling because of the deficient coronary circulation.

In Korea the Americans had developed a very highly-organised blood-transfusion service which provided banked blood at all levels in adequate quantities. The blood was obtained in the United States and flown in special planes from California to Tokio, and thence to the army in Korea, where it was available for use when about seven days old. Blood was supplied freely forward to the M.A.S.H. level but ahead of this plasma-expanders (dextran) were used.

In the R.A.P.s and field ambulances the rule was that nobody should be evacuated unless his systolic blood-pressure was over 100, except patients with uncontrollable hæmorrhage, head injury, and severe chest lesions. In those units dextran was given until a satisfactory blood-pressure was reached and hæmorrhage arrested. Those severely injured were evacuated with the dextran drip still running and, wherever possible, they were taken by helicopter.

It should be emphasised here that the only fluid given to a badly wounded man in the R.A.P. or field ambulance should be intravenous. Fluid is not absorbed from the stomach, owing to the reactive vasoconstriction, and it may be vomited or regurgitated with serious results. Moreover, such a patient is going to have a general anæsthetic within an hour or so, and a loaded stomach only adds to the anæsthetist's difficulties in dealing with already bad risks.

The teaching that hot sweet tea should be part of the treatment of a shocked patient in R.A.P., C.C.P., and advanced dressing station (A.D.S.) still persists in some publications, but the practice is thoroughly bad and such instructions should be withdrawn without delay.

HELICOPTERS

There can be no doubt that the helicopter is an invaluable aid to the evacuation of battle casualties and it should be introduced as a standard method. The helicopters used must be definitely allotted and adapted for this purpose. They should be organised in evacuation flights or squadrons and must be directly under the operational control of the Corps D.D.M.S. and should carry Geneva markings. They are especially valuable in rough and jungle terrain and the only limitations to their use would appear to be their inability to fly over high country. In Korea the United Nations Forces enjoyed air-superiority over the battle front and this naturally made helicopter evacuation a much simpler problem than it might otherwise have been. In a future war this air control might not be so easy, but with the use of Geneva-marked machines and low-altitude technique it should still be possible to make considerable use of this method.

Later Treatment

RESUSCITATION

On arrival at the M.A.S.H. the patient was again assessed, and resuscitation was either continued or begun until the systolic blood-pressure was stabilised at over 100. No operation was undertaken until this was achieved. At the M.A.S.H. blood was invariably used, and it has been found that massive and rapid transfusions can be given to the wounded man without overloading his circulation, except in cases of open chest wounds and head injury. In patients with severe limb damage—especially when there is more than one traumatic amputation—resuscitation may prove very difficult, but the use of tourniquets will prevent further fluid loss in damaged limbs.

Intra-arterial transfusion was very useful in patients not responding to intravenous blood and in some men who were apparently on the point of death. The transfusion should be given rapidly and under pressure into the posterior tibial artery at a rate of three or four minutes per pint of blood. This fills up the arteries quickly and forces blood into the coronaries. Because of a few catastrophes the use of the radial artery was abandoned early on. Lack of collateral circulation or of adequate continuity between the branches of the radial and ulnar arteries resulted in gangrene.

Large quantities of blood were also used in the British Commonwealth General Hospital, where it was given as a routine to all patients coming back with a hæmoglobin of under 60%, and in all cases of extensive injury, before and after operation. In addition, a fair amount of emergency blood was required for secondary hæmorrhage and local accidents.

Here the blood was not imported but was obtained fresh from local troops; and, except in an emergency, freshly cross-matched blood was used, with special attention paid to the Rh factor. In the early days the standard Bristol taking and giving sets were used. Many of these had been used previously and then cleaned, re-sterilised, and re-issued from a central pathology laboratory. There was, however, one fatal tragedy and this, on investigation, appeared to be due to contaminated apparatus or tubing. Thereafter disposable, "one-time-only" sets were obtained through Canadian Army channels, and these were used exclusively for both taking and giving blood. So far as supplies allowed Canadian 'Transfusovac' bottles were used also for collecting blood but, when

these were not available, locally prepared Bristol bottles were used. The only trouble with these sets was a slight tendency to get blocked when blood was being given slowly, and here it was simple enough to change straight over to another set.

There can be no doubt that the use of commercially prepared bottles and blood-giving sets greatly reduces the risk in blood-transfusion and also saves many man-hours. Moreover, they are very cheap and they may in fact save money. It would be to the Army's great advantage to introduce them as standard equipment.

SECONDARY SURGERY

On arrival at the British Commonwealth General Hospital all casualties were seen and assessed by the surgeon on duty, who arranged any immediate treatment required but did not disturb the dressings. He prepared operating-lists for the following day and included all patients except those whose general condition was bad and who were deferred for supportive treatment. After admission to the receiving wards all were examined by the duty anæsthetist who prescribed preoperative medication and arranged cross-matching for those whom he considered would need blood.

In the morning the patient was taken to the operating-theatre, a radiograph being taken on the way if there was any possibility of retained foreign bodies or fracture. Under general anæsthesia the dressings were removed and the wounds inspected.

Delayed Primary Suture

The wounds and surrounding skin were then thoroughly cleaned first with ether-soap, washed away with copious water, and then with cetrimide (' Cetavlon ') or domiphen (' Bradosol '). Finally the wound was temporarily covered and the skin painted with acriflavine. In clean debrided wounds which were less than seven days old the skin edges and the granulating surface were then freshened with a scalpel and the skin freed by undercutting. Most surgeons use a knife for undercutting but blunt dissection with Mayo scissors is just as satisfactory.

The wound was now ready for delayed primary suture and, provided this could be done without tension, complete skin closure was attempted. A debrided wound gapes widely but with careful technique a high proportion can be brought together and sutured.

No attempt was made to stitch soft tissues, but where fascial gaps could be brought together they were repaired with interrupted catgut stitches. Small holes in the fascia which cannot be closed tend to give trouble later and those were converted into longitudinal slits with scissors. Then, before any skin stitches were inserted, the skin edges were brought together and held in position by Lane's forceps. This is a very important step because it allows the surgeon to experiment with the best position to avoid tension, everts the skin edges, and enables him to put in all his stitches loosely. Moreover, it enables him to get more closure without tension than if he started stitching at the ends of a wound and worked inwards. With the Lane's forceps at 2–3 in. intervals the everted skin edges were then closed with interrupted silkworm-gut stitches at $^1/_2$-in. intervals. This use of Lane's forceps undoubtedly increases in many wounds the area of primary skin closure and so cuts down the extent of skin-grafting required. This is important, for no skin-graft can be as good as skin in situ with its original blood and nerve supply, and its vasomotor control. The choice of suture material is largely a personal matter; silkworm gut is non-capillary, does not slip, and is easily removed.

Secondary Suture

Wounds over six days old cannot be freshened and must be excised and then closed by secondary suture. To facilitate closure, relieving incisions, Z-plasty, and other plastic procedures were often used, since it is preferable to close the original wound by suture even if it means that grafts have to be applied elsewhere. This is especially so where bones, joints, and tendons are exposed. A wound with exposed bone in its depth never stops discharging. The commonest site for this is in the lower leg and here the cross-leg whole-skin flap is valuable.

When complete closure could not be achieved the wound was left open and dressed with tulle gras. Four days later it was re-examined under anæsthesia and, because of shrinkage of tissue due to wasting and absorption of the œdema fluid, it was often possible to get additional closure. Areas which still could not be closed were then covered with split skin-graft.

Infected Wounds

The procedure I have described can be used only in wounds which have been adequately debrided at primary surgery and which are free from infection and sloughs. If infection is obvious to the naked eye an altogether different régime is necessary. Small localised sloughs which do not appear to be infected can be excised, but if the sloughs are at all extensive the wound must be regarded as infected.

About 9% of the wounds arriving in Japan were found to be infected. Infection varied from the superficial type, probably caused by contamination with pyocyaneus during evacuation, to massive, stinking wounds with large pockets of foul pus, associated with proteolytic digestion of devitalised tissue, caused by contamination at the time of injury and incomplete debridement. The incidence of this kind of infection was low—about 2%. No gas gangrene was seen among the cases evacuated to Japan.

These infected wounds were cleaned with soap and water followed by cetrimide. The wound was then opened up thoroughly, all dead and infected tissue being ruthlessly excised, until an open saucer of healthy red tissue was exposed. Retained foreign bodies were a common finding and were removed. These were commonly pieces of metal and clothing but unusual articles were sometimes found—as for instance two pennies in an abdomen and a 6-in. long zip-fastener in the substance of the soleus muscle. After the wounds had been opened up and cleaned out, some hydrogen peroxide was run in and allowed to bubble for about five minutes before washing it out with water. The surface of the wound was then dressed with tulle gras and covered with gauze and gamgee dressing. The patient was then returned to the ward and started on large doses of penicillin. Pus was sent to the laboratory for identification of organisms and sensitivity tests.

It was usually possible to close the superficially infected wounds in four days, but in some the infection was very hard to eradicate. This was particularly true of wounds infected with pyocyaneus and proteus and many methods were tried to combat this.

Laboratory findings usually showed that these organisms were only sensitive to chloramphenicol, but chlortetracycline (aureomycin), streptomycin, and oxytetracycline (terramycin) were used when indicated. Polymyxin was not then available. Those sensitive to chlortetracycline, streptomycin, and oxytetracycline usually yielded to them, but the pyocyaneus—although sensitive to chloramphenicol in the laboratory—seldom seemed to be affected by it; and the most useful measures were eusol soaks and ultra-violet light. In a few extensive and resistant infections, eusol was successfully used in the Carrel-Dakin manner.

Towards the end of the war, domiphen was used in strengths of 1 : 5000 or 1 : 2000, and it was very effective in killing persistent organisms.

When infection had been controlled the wounds were treated wherever possibly by secondary suture. The skin edges were excised, surfaces freshened, hæmostasis secured, and the wound sutured without tension. If this could not be done, saline dressings were applied and split grafting carried out twenty-four hours later.

The prevalence of gross wound infection bore no relation to the time of arrival at the hospital in Japan, except in so far as those that took longest to arrive were more septic and toxic. The pyocyaneus infections, on the other hand, were practically confined to patients

who arrived on the sixth day or later. It seems that any open wound—no matter how carefully it might be protected—will become infected if not closed within one week, unless the patient is confined to bed and the affected part is kept at complete rest. These conditions are manifestly impossible when a patient is being evacuated; every time he is moved from one conveyance to another, or in and out of bed, his dressings are bound to move and encourage the encroachment of organisms. Moreover, the movement of a dressing on the surface of the wound breaks the coagulum and increases serous outflow with consequent moistening of the dressing. This increases capillary attraction and provides a route of invasion for organisms. The long line of evacuation from M.A.S.H. to hospital must be held responsible for much infection which would have been avoided if the definitive surgery had been done in Korea.

Amputations

The U.S. Army medical authorities laid down that all major amputations must be done by the modified guillotine method; and those coming back to Japan were always of this type apart from a few done by Norwegian surgeons.

American Army surgeons do the amputations at the lowest level of circumferential sound skin; and then they apply traction by painting an adhesive cement on the skin and slipping a stockinet-glove or stocking over this. A padded plaster cast is applied to the limb, incorporating the trunk or pelvis if necessary. A Kramer-wire U-shaped extension is incorporated in the plaster and extends as a protection beyond the stump. Traction is then applied by tying the ends of the stockinet to the wire with elastic rubber. This, they argue, ensures that the amputation is clear of contaminated skin and tissue, and there is no danger of pockets to collect pus. It is also a safer procedure in the hands of relatively inexperienced surgeons.

This, of course, is contrary to the British practice of saving as much limb as possible and using as much sound skin as is available for flaps. The American Navy surgeons take the same view as the British surgeons and advocate an open-flap operation (Canty 1952).

To go above all injured skin, as is necessary in the guillotine amputation, means that much more of the limb has to be sacrified than if sound skin was saved as flaps; and this is particularly so in war wounds where damage is very often more extensive on one side of the limb than the other. It is sometimes very easy to get a long and healthy flap from the less damaged side which allows the fashioning of a stump several inches longer. As a result of the guillotine method, many stumps, even when they can be closed easily, are very short; and they are certainly not suitable for the Roehampton type of prosthesis. Thus, re-amputation above a higher joint might ultimately be necessary to enable the fitting of a satisfactory artificial limb. This short stump might not be such a disadvantage with the suction sockets used in the United States.

The closure of the guillotine amputation depends on the possibility of pulling a cuff of skin and soft tissue down over the exposed bone ends. This is not usually difficult in the thigh and upper arm; but in the lower leg the tissues are not freely movable, and almost invariably it was necessary to fillet out bone before closure was possible. Often it was necessary to resort to skin-grafting to preserve a stump of adequate length.

Another complication was that in several amputations below the knee traction by stockinet had caused large pressure sores over the subcutaneous surface of the tibia, and this again sometimes made further amputation or skin-grafting necessary. Delay in reaching hospital in Japan might have been a contributory cause of this complication. Pressure sores were also seen on occasion over the sharp lower ends of the transversely cut bone.

Generally speaking, British surgeons expect the first amputation to be at the definitive level whereas the Americans accept the need for re-amputation at a higher level in a large proportion of the cases as inevitable. I think it is better to fashion flaps from any sound skin available and leave them open, provided that care is taken to remove all soiled and devitalised tissue. Even a few retaining stitches are inadvisable unless the same surgeon is going to perform the delayed primary suture in the same hospital. These flaps should be made, if anything, on the large size, since it is a simple matter to trim them and improve their shape when doing the closure.

Hæmothorax

It has been established that a traumatic hæmothorax must be emptied by aspiration, and kept empty by repeated aspiration, to prevent the formation of clot and the consequent fixation of collapsed lung and diaphragm (Brock 1953). In spite of this 9% of cases required thoracotomy and decortication during the late war (Statistical Report 1948).

Because of the long time and distances of evacuation from Korea to Japan cases which had been aspirated and emptied at the M.A.S.H. often arrived at the British Commonwealth Hospital several days later with massive effusions of blood or serum. In spite of this delay, it was always possible to empty the chest after arrival, provided a very wide-bore needle was used.

The wide-bore needles from the Bristol transfusion set were adapted for this purpose by shortening them, cutting down the bevel, and boring a lateral hole $^1/_2$ in. from the end. The blood obtained usually layered and clotted as soon as it was out of the chest. To prevent any remaining blood or further effusion clotting I then made a practice of injecting 15,000 units of heparin into the pleural cavity at each aspiration. This was apparently effective for it was necessary to proceed to decortication only in 2 cases—one was an infected hæmothorax, and the other a man in whom the right middle lobe was so badly lacerated that two large pieces were loose in the pleural cavity. The lobe was removed and good expansion followed decortication of the other lobes and the diaphragm.

In the hope that any clots already formed might be broken down I injected 'Tryptar' in 2 cases and 'Viridase' (streptodornase/kinase) in 3, but these, particularly the tryptar, caused so much pain and pleural shock that I did not repeat this treatment.

Of 1000 consecutive and unselected Commonwealth casualties 261 had wounds of the chest wall and 29 had penetrating chest wounds with hæmothorax. Only 1 case of infected hæmothorax was seen in eighteen months.

It is difficult to compare the first figure (26%) with published figures, but the *Statistical Report on the Health of the Army for 1943–45* (1948) states that wounds of the trunk accounted for 12·2% of all wounds, and the *Medical History of the Great War* (1922) gives a total of 11·1% for wounds of the chest and back. Beebe and De Bakey (1952) state that thoracic wounds were 14% of all wounds in the American 5th Army in Italy; and d'Abreu (1951) estimated their incidence at 8% in the late war.

While the incidence of chest wounds seems to have doubled in Korea, the proportion of penetrating chest wounds was only 2·9%. It may be that the protection afforded by the armoured vest helped to cut down the penetrating power of missiles. This would account for the increase in the proportion of survivors, the greater number of superficial wounds, and fewer penetrating wounds.

Arterial Surgery

Undoubtedly the main advance in surgical technique during the Korean war was in the repair of arteries. A group of surgeons from the Army Medical Service Graduate School, Walter Read Army Medical Center, Washington, D.C., formed a vascular-surgery team at 8055 (later 43) M.A.S.H. There they dealt with cases of vascular injury and ran courses of instruction in the technique of arterial repair and grafting. The importance of this is shown by the fact that in the 1939–45 war 20%

of all amputations were necessary because of direct injury to a main artery.

When the injury included damage to a major artery, the wound was cleaned and debrided in the usual manner, and the artery was freed from surrounding tissue for 2–3 in. in either direction. Small holes in the artery were then repaired transversely by interrupted stitches of fine silk. In more extensive injuries the damaged portion of the artery was excised, bleeding being controlled by Potts clamps which also held the ends of the vessel in apposition. Spasm was overcome by 2·5% papaverine locally, but not parentally.

The freeing of the artery allowed of easier approximation of the cut ends. They were brought together and two stay sutures inserted diametrically opposite each other. A continuous everting stitch of fine silk (00000) was then run from one stay suture to the other with the needle holes 1 mm. apart. When one side was completed the artery was turned over and the process repeated on the other side, the clamps being then removed. Postoperative heparin or other anticoagulants were not used; they appeared unnecessary—quite apart from their obvious danger in wounded men.

When the cut ends of the artery could not be approximated, autogenous vein-grafts were inserted, using a similar technique.

After operation the affected limb was flexed and splinted in plaster-of-paris to reduce tension on the repaired vessel.

In the Korean war, of 79 cases treated by primary arterial repair by the vascular unit, only 18 ultimately required amputation (Hughes 1955). This certainly seems to show that the results of primary repair compare very favourably with those of ligation in previous wars. Long follow-up will be necessary, but it can be said that, while an ischæmic and functionally inefficient limb can often be the result of ligation, such a misfortune has not yet been seen in any of Hughes's cases. And there has been only one instance of secondary hæmorrhage after repair.

These impressive results must make end-to-end anastomosis and grafting of arterial injuries a standard practice in immediate war surgery. Only follow-up will show whether free vein-grafts or frozen artery-grafts give better results. The technique is simple and calls only for careful and accurate work. Potts clamps could with advantage be added to the equipment of the C.C.S. and other surgical units.

I had occasion to explore 3 cases of arterial anastomosis because of painful nerve lesions. Of these 1 was in the popliteal artery and 2 in the brachial. In each, the anastomosed artery was obliterated but the distal circulation was satisfactory and the limb had a good blood-supply. It is possible that this result would have been obtained if the brachial arteries had been ligated in the first place, but interruption of the popliteal artery normally means the loss of the foot; and it seems that, even if the artery ultimately blocks, the gradual narrowing after end-to-end anastomosis allows and encourages the establishment of an adequate collateral circulation.

Late vascular complications were not uncommon in the British Commonwealth Hospital. The commonest was secondary hæmorrhage in amputation stumps and in deep slightly infected wounds. Usually the bleeding vessel was tied; but in two button-holed superficial femoral arteries and one profunda-femoris artery it was possible to repair the vessel wall.

Another vascular complication was arteriovenous aneurysm, of which 6 were seen—2 brachial, 2 femoral, 1 upper popliteal, and 1 subclavian-innominate. In the first 5 the vein was ligated and excised, and the opening from the artery into the false aneurysm repaired with 'Dermalon' suture transversely. One of the brachial aneurysms had three separate openings into a large aneurysm and it was possible to close these separately.

During the operation the artery was dissected clear for 1–2 in. above and below the aneurysm and controlled with tapes. In these cases the immediate result was good, but they could not be followed up. The patients were saturated with heparin before these operations, and during the operation heparin was instilled into the wound. Postoperatively heparin was continued for three or four days, and papaverine was injected into the wound to relieve spasm.

One of the femoral aneurysms was treated and described in detail by Major J. T. Hueston (1953a).

Splinting

All men with serious wounds and fractures of the lower limb were evacuated by the Americans in padded spica casts and not in Tobruk splints, as had been customary in the British Army. The Tobruk method consists of applying a Thomas's knee splint and incorporating it in plaster-of-paris, as described in the British *Field Surgery Pocket-Book*. It is, in my view, usually preferable to a complete spica for the following reasons:

(1) The complete spicas are heavily padded and it was found that the positions of femoral fractures altered considerably in transit, the padding having prevented adequate fixation.

(2) The movement of the cast and the thick warm padding encouraged infection.

(3) Sacral and iliac pressure sores were a not uncommon finding when the spica was removed.

(4) The weight of the cast and the spreading of the leg made careful handling and transport much more difficult, particularly when the stretcher had to be loaded in an aircraft.

Much the same objections apply to a shoulder spica, and patients travel better in a plaster cuirass which incorporates the injured arm across the front of the chest.

The Tobruk plaster is easily applied, gives very good fixation, and it is relatively light and compact, thus making for easy handling.

Burns

During the cold winter in Korea the troops resorted to a great variety of improvised oil-burning stoves, and accidents were many and often serious. In war the need for evacuation governs the treatment of burns, and it is necessary to lay down a standard routine. In the Commonwealth Division all burns at R.A.P. or field-ambulance level were covered with occlusive dressings and evacuated as speedily as possible to the Canadian F.D.S. Here fluid and blood replacement was started; and the burned areas were cleaned thoroughly with cetrimide and dressed with an absorbent dressing.

For this Major L. Lawson, R.C.A.M.C., had special dressings made which consisted of an inner layer of fine-meshed cotton-nylon gauze, a middle layer of absorbent cotton, and an impervious outer layer. These were sewn together and were made into 9-in. by 6-ft. rectangular pads which could be wrapped round a limb or the trunk. This dressing was applied to the burnt area and the patient evacuated by air to Kure on the third or fourth day.

In the British Commonwealth Hospital all burns were treated in a special unit (Hueston 1953b). New cases were treated by the exposure method from the beginning, and evacuated cases were converted to the exposure method on the day after arrival. The staff of the burns unit were all keen converts, and it need only be said here that the uniformly good results, and the ease with which the apparent technical and nursing difficulties were overcome, were very impressive.

This account of surgery in the Korean war is founded on my experience of almost two years as senior member of a large team of Australian, British, and Canadian surgeons. I am indebted to them all for their help and coöperation, especially to Major A. Campbell Derby, F.R.C.S.(C), R.C.A.M.C., and Major J. T. Hueston, F.R.C.S., R.A.A.M.C. In particular I must acknowledge the inspiration of Colonel A. N. T. Meneces, C.B.E., D.S.O., M.R.C.P.; for the success and unity of the British Commonwealth General Hospital was, above all, due to his experience, knowledge, and tactful leadership.

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X-RAY HAZARDS FROM TELEVISION APPARATUS AND CATHODE-RAY TUBES

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IN reply to a letter on the possible danger from X rays to television viewers, *The Lancet* (1956) stated :

" We understand that Dr. Chisholm's important question can be answered reassuringly—for television-viewers at any rate. The television sets at present in general use are of low voltage, and the manufacturers see to it that the tube is screened in such a way that no significant quantity of radiation escapes. But technicians and others who regularly handle sets with the screening removed may be repeatedly exposed to low-energy X rays, and the risk they run in this way deserves close attention."

It is my practice to check at intervals the effects of radiation in technicians and research-workers testing or manufacturing television or other electronic apparatus in factories under my supervision. The industry is well aware of the risks of radiation associated with the production of cathode-ray tubes and valves containing radioactive materials. The British Standards Institution (1955) also draws attention to the dangers of X radiation from equipment containing high-voltage cathode-ray tubes and rectifying valves.

Browning (1956) points out that exposure to small amounts of radiation over a long period can gradually change the blood. She cites the International Commission on Radiological Protection (1955) as postulating a permissible dose of X gamma radiation of the whole body of 0·3r a week.

It was therefore of interest to study the exposure of personnel at risk for long periods to voltages higher than those at present used in apparatus supplied to the public.

Experimental

The effect of radiation dosages was checked in research workers engaged in developing and testing all types of television and similar equipment which make use of cathode-ray tubes operating at higher voltages than those sold for general use. Six men were usually engaged very close to possible sources of radiation, bending over chassis, adjusting parts, and soldering. All wore monitoring X-ray films for a week and were exposed for practically the whole time to either the set they were adjusting or to other sets only a few feet away. One man was engaged in research on high-voltage tubes associated with colour television. The films developed by the Radiological Protection Service, showed that a week's exposure of all the workers was less than 0·05 rad.

To confirm that there was no hazard to working personnel a further test was made. ' Kodirex ' X-ray film was applied to the front of television tubes on continuous run as follows :

15-inch colour tube at 20 kV for 42 hours.
17-inch black-and-white tube at 13 kV for 43 hours.
21-inch black-and-white tube at 16½ kV for 42 hours.

After being developed in ID 20 (Ilford) at 20°C for 5 minutes the films showed no radiation effect.

A further test was arranged in a department manufacturing cathode-ray tubes where four operatives (three men and one woman) who test such tubes for faults are exposed for up to 40 hours a week. Once again the average weekly dose for a week's exposure was less than 0·05 rad. In addition two test films were placed against test sets run continuously for 5 days, and again the average dose was less than 0·05 rad.

Some people who have been engaged for some years in handling radioactive electronic valves containing minute amounts of radioactive cobalt were monitored with test films, all of which showed that the exposure was well below the permissible maximum. There is a danger in the use of such equipment when the glass envelope of the valve breaks, with possible contamination of the skin or cuts permitting entry of radioactive particles, and exposure is increased where large quantities of valves are stored. Strict regulations for handling were enforced and all personnel instructed and supervised. Since all the users were trained engineers, no difficulty was experienced. All the containers are now clearly labelled " RADIOACTIVE."

Conclusions

It therefore appears from these tests that there is little danger to the public from X rays from cathode-ray tubes used in television sets if tubes of the present voltage continue to be used.

The glass faces of tubes at present in use are thick enough to absorb X rays which may be generated from a beam of up to about 16 kV on the screen under normal working conditions. There is, however, a minimal source of danger from the neck or cone region, where certain coils may need to be adjusted during the course of manufacture. In such cases the direction of the beam may be deflected. Even so there is little or no exposure, because these deflecting or scanning coils fit into an arranged position for each chassis, and there is, in my opinion, no danger that the beam may pass other than along its predetermined path if the method of manufacture is reasonably planned and supervised. I reach this conclusion after having seen many thousands of sets manufactured since post-war television was introduced. I emphasise that this slight hazard can only apply to a few operatives who align the tubes and does not concern the home users of television sets.

Summary

Nine men and one woman were exposed for one working week to cathode-ray tubes subjected to voltages up to 20 kV and monitored for irradiation from X rays and cathode-ray tubes.

Monitoring films were attached to television sets at higher voltages for longer periods than is possible under present conditions of home viewing.

In all the tests the results were below the tolerance level specified by the International Commission on Radiological Protection.

Television sets working under home conditions are not likely to be a source of danger from X rays, because adequate safety standards are incorporated in such apparatus, and such safety standards are continually being revised and adopted by the industry. It may become necessary to adopt new standards of protection if changes are made in television receiving equipment.

I am grateful to Mr. K. I. Jones (chief television engineer, A.C. Cossor Ltd.) for his advice and coöperation.

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Occasional Survey

FLUORINE AND TEETH

In this country the story of fluorine and its effects on the teeth began in 1892, when Crichton-Browne [1] suggested that fluorine might be added to the diet, especially of pregnant women, to improve the condition of the teeth. This observation seems to have been ignored at the time, and, although a peculiar malformation of dental enamel in the teeth of Italians living near Naples was first described in 1901 and a similar condition in the inhabitants of Colorado Springs, Colorado, seven years later, it was not until 1931 that fluorine was considered as a possible cause of what soon became known as dental fluorosis, or mottling of the teeth.[2] A few years before it had been noticed that mottled teeth, however displeasing to look at, were more resistant to caries than normal teeth; and so a substance which could cause one dental disease became a possible means of treating another.

The mass of data from all parts of the world which has been accumulating steadily since the early 1930s has established that fluoridated water can considerably reduce the incidence of dental caries.[3] Two contrasting examples of the action of fluorine may be quoted. The public water-supply in Slough has a natural fluorine content of 0·9 part per million (p.p.m.); of the children, aged between 11 and 16, who had lived in Slough for the whole of their lives, 30% were completely free from dental caries.[4] In New Zealand, on the other hand, few water-supplies contain more that 0·25 p.p.m. of fluoride, and the incidence of caries among both Europeans and Maoris is notoriously high.[5] At the recent International Congress of Pædiatrics, Helmholtz,[6] putting the case for fluoridation, said that caries incidence could be reduced by more than 60%, and that the protection afforded to the teeth lasted well into middle age. During 1955, the standing medical advisory committee of the Central Health Services Council [7] considered the question of the possible harmful effects of fluoridation to 1·0 p.p.m. Their conclusion was that there was no scientific or medical evidence to suggest that there was any risk in drinking water containing fluorine at that concentration.

Fluorine is a natural constituent of much food and drink, such as fish, tea, and beer, which may contain up to 1·4 p.p.m. The amount of fluorine in a cup of tea is only about 0·12 mg., although dry tea contains between 75 and 100 p.p.m. of fluoride. Fish contains about 5–15 p.p.m.: the average consumption of fish in England is about 20 g. per head per day at the age of 12 —or 0·1–0·3 mg. of fluoride, which is hardly excessive. The daily intake of water is less variable than that of any other item of food and, according to McCombie,[8] "normally some four times as much fluoride is consumed from fluoridated water as from the usual foods." Pilot studies in London [7] indicate that the probable daily intake of fluorine is as follows:

	Water containing no fluorine	*Fluoridated water at 1 p.p.m.*
Men	1·8 mg.	3·2 mg.
Women	1·3 mg.	2·2 mg.
Children	0·6 mg.	1·2 mg.

These figures are well below any intake known to cause toxic effects. In fact, as the dean of the dental school in Baltimore has put it, with fluoridation at 1 p.p.m., it would take 1000 gallons of water to be fatal in a single dose.[9] As the lethal dose of sodium fluoride is rather more than 4 g., it is impossible to drink enough water, even fluoridated to the improbable level of 20 or 30 p.p.m., to produce acute toxic effects. It is not possible for any mechanical failure of the fluoridation plants now in use to raise the fluorine content of the water to a dangerous level.[10]

It also seems very unlikely that the continued ingestion of 1 p.p.m. of fluorine will do any harm. In the United States, there is an area in which the water contains 13·7 p.p.m. of fluoride and observations of the inhabitants over a period of 19 years have shown no disturbances to their physical health, other than severe mottling of the teeth.[11] The metabolism of fluorine in the body is not known, but some seems to be retained whatever the level of intake, since appreciable amounts of fluorine are found in the bones of those who have never drunk fluorine-containing water or been exposed to an industrial hazard. The amount of fluorine in bones increases with age. There is a direct relationship between fluorine intake and the urinary excretion of fluoride, at least up to a daily intake of 4–5 mg., which corresponds to a quart of water containing 4–5 p.p.m. fluoride; and the same type of excretion occurs even in the presence of renal disease.[10] If the intake is much greater, some fluorine is stored in the bones, but at least 90% of this is slowly excreted in the urine. No radiological changes in bone structure have been detected in those living in areas with up to 8 p.p.m. of fluoride in the water; at higher fluorine levels, increased bone density has been observed, but it was not accompanied by any functional disability or by any liability to fractures. As the Fort Williams study [12] has shown, even advanced radiological changes are compatible with complete absence of symptoms.

Attempts have been made to discover whether fluorine is an essential nutrient for animals; but fluorine-free foods are difficult and expensive to prepare and only one such study has been carried out.[13] Experimental animals failed to grow and their reproductive performance was poor. It may be therefore that fluorine is essential for optimum bone and tooth formation, although retardation of growth has never been demonstrated in human beings. Fluorine is largely held back by the placenta, and there are only very small quantities in breast-milk. No work has yet been carried out in high-fluorine areas on the incidence of caries and mottling in the teeth of breast and bottle fed babies, but such a study is under discussion.[7]

The only report of ill effects from fluorine in water comes from Oxfordshire where an association has been described between dental fluorosis and juvenile osteochondritis of the spine (Scheurmann's disease).[7] But this is unsupported by other studies, and further investigations are in progress. The United States Public Health Service has reviewed the mortality-rates from 1940 to 1950 in 32 pairs of fluoride (0·7 p.p.m. or more) and non-fluoride (0·25 p.p.m. or less) cities. This inquiry dealt with the deaths from heart-disease, cancer, intracranial lesions, nephritis, and cirrhosis of the liver. There was no significant difference between the mortality-rates of the fluoride and non-fluoride cities for all causes.[14] There seem to be no grounds for suggesting that fluorine is a carcinogen or that it reduces the length of life.

Fluorine occurs as a trace element in many surface and well waters, but the amounts present are negligible

1. Crichton-Browne, J. *Lancet*, 1892, ii, 6.
2. Lufkin, A. W. A History of Dentistry. London, 1948; p. 229.
3. Mackenzie, E. F. W. *Lancet*, 1952, i, 960.
4. Report of the Minister of Health for 1954. Part II. H.M. Stationery Office, 1955. See *Lancet*, 1955, ii, 1289.
5. Hewat, R. E., Eastcott, D. F. Dental Caries in New Zealand. Medical Research Council of New Zealand, 1956.
6. See *Lancet*, Aug. 11, 1956, p. 299.
7. Report of the Central Health Services Council for the Year ended Dec. 31, 1955. H.M. Stationery Office, 1956.
8. McCombie, F. *Canad. J. publ. Hlth*, 1954, **45**, 6. Quoted by Chalmers Clarke, J. H. (ref. 10).
9. Robinson, J. B. *Amer. J. publ. Hlth*, 1954, **44**, 7.
10. Chalmers Clarke, J. H. *J. Brit. Waterwks Ass.* 1955, **37**, 664.
11. Helmholtz, H. F. *Amer. J. publ. Hlth*, 1954, **44**, 7.
12. Industrial Fluorosis. Medical Research Council memorandum no. 22. H.M. Stationery Office, 1949.
13. Crendon, J. F., Gershon-Cohen, J. *J. Agric. Food Chem.* 1953, **1**, 464.
14. Pasternack, H. *Publ. Hlth Rep., Wash.* 1954, **69**, 5.

in 90% of the water-supplies in England and Wales.[10] It is present in Thames water at 0·1 p.p.m., and in waters in Durham, Essex, Derbyshire, Oxfordshire, and part of Nottinghamshire in concentrations between 0·6 and 1·2 p.p.m. A few waters contain greater amounts—2·0 p.p.m. in West Hartlepool, and as much as 4 p.p.m. in South Kesteven, where the water comes from the Lincolnshire limestone strata. The highest concentration is 5·8 p.p.m. at West Mersea in Essex; in Maldon the concentration has been reduced by admixture with fluorine-free water. The numbers of those drinking water at different fluoride levels is not yet known in this country, but details are being collected.

Most fluoridation projects in the United States have used either sodium fluoride or sodium silicofluoride, but three other compounds have been tried to a limited extent—ammonium silicofluoride, hydrofluosilicic acid, and hydrofluoric acid. Sodium fluoride is fairly soluble in water; sodium silicofluoride is rather less so, but has the advantage of cheapness since it is a by-product of the phosphate industry. It also raises fewer technical problems in the fluoridation equipment, although some authorities say that metering is easier with hydrofluosilicic acid. Hydrofluoric acid is an unpleasant and dangerous substance to handle, and ammonium silicofluoride cannot be used where the water is chlorinated. The cheapest compound of all, calcium fluoride, cannot be used because of its low solubility; but it could perhaps be used in a large treatment plant.

It has been suggested that there is some difference between the action of naturally occurring fluoride and that added artificially. This is unlikely because fluorides, up to a concentration of 12 p.p.m., ionise immediately in water. McClure[15] states that "the physiological effects of different fluorine salts will depend on their absorbability from the intestinal tract"; but at low concentrations the most important factor is not the difference in solubility, but the ease with which the compounds ionise. The ionisation of the important sodium silicofluoride is more complicated than that of sodium fluoride, but a possible reaction is that put forward by Royas and Slutskaye[16]:

$$Na_2SiF_6 \rightarrow 2Na^+ + SiF_6^{--}$$
$$2H_2O + SiF_6^{--} \rightarrow 4H^+ + 6F^- + SiO_2$$

McClure[15] was able to show, in experiments on rats, that there were no physiological differences between the action of sodium fluoride and sodium silicofluoride when administered in drinking-water.

In 1953, after discussions with the Minister of Health, local authorities in Andover, Darlington, Watford, Anglesey, and Kilmarnock agreed to try fluoridation. Darlington, under pressure from an anti-fluoridation committee, withdrew from the scheme, but the fluoridation of water-supplies in Anglesey began at the end of 1955. It seems that no other official backing or financial help will be given for at least 5 years to any other local authority who might wish to adopt fluoridation.[10] The official view at present is that, by arranging these demonstrations in selected areas, sufficient steps have been taken to give a full opportunity for well-informed public opinion to develop.[7] But the benefits of fluorine may become apparent in less than five years. A recent study in Norway, Maine, has shown that statistically significant changes can be observed after 18 months of fluoridation.[17] The incidence of caries was reduced, existing cavities developed more slowly, and the fluoridated water had a local action as it washed over the crowns of erupted teeth.[18]

15. McClure, F. J. *Ibid*, 1950, **65**, 1175.
16. Royas, I. G., Slutskaye, M. M. *J. phys. Chem.* (*U.S.S.R.*), 1940, **14**, 701.
17. Garcelon, A. H. *New Engl. J. Med.* 1956, **254**, 1072.
18. Bushel, A., Smith, D. J. *N.Y. J. Dent.* 1955, **25**, 215.

In England Now

A Running Commentary by Peripatetic Correspondents

"ALL this talk about tomtits opening milk-cans makes me thirsty," snorted Ananias. "Yes, thanks, make it a pint—otherwise the ullage upsets my stomach.

"Why I once had a parrot that could open beer-cans. I was a ship's surgeon and we were sunk; when day broke I was alone on a sandbank a hundred yards across and surrounded by floating cans of beer. There was no water and by a culpable oversight I had no can-opener. Away in the heat-haze was an island and there were more sharks than black blobs in a helping of caviare. I passed the first day beating cans of beer together and loosening my teeth on the caps. The next morning I was awakened by the heavy breathing of a parrot which had just touched down. It held up a can of beer and neatly bit off the cap.

"'Good pull-up for parrots, mate,' it said. 'I say you've been clobbered a bit—you've hardly any feathers left. What you need is a beer.' We drank our healths and had one or two more. 'If this continues I shall charge you corkage,' said the parrot, and fell over unconscious.

"I spent half the night fanning it with a piece of seaweed, and about dawn it sat up and clutched its brow with one claw. 'Hell,' it complained, 'can't you keep still instead of stamping around like that; and you ought to decide how many there are of you. The trouble is, you've had too much to drink. You should give it up. Sign the pledge like I'd do if I hadn't already.' Here it gave a burp that blew it six feet backwards, 'Did I do that?' it asked, impressed; then, looking at my beard, 'Your feathers are growing again, mate—let's celebrate. A feather of the hawk that pecked you.' 'Be a good fellow,' I said, 'and fly over and arrange for me to be rescued.' 'How about one for the road—or rather, the wild blue yonder?' suggested the parrot. He refuelled and took off, but was back the same afternoon. 'I did my best,' he apologised, 'but all they said was, "Oh these drunken parrots will tell you anything," and took no notice. Anyway, stop being so damned lazy—any night this week you can walk across to the mainland at low tide.'

"So that's what I did," concluded Ananias. "In fact it was all that walking that gave me my incurable thirst. Thank you, I'll have another—a bird (even a parrot) can't fly on one wing."

* * *

I knew it was time to dispense with the old car. She was third-hand when I had bought her and from the first had all the symptoms of diabetes oleaginosa. Coming up the Great North Road I had, like the Good Samaritan, often to pour in oil and wine. Her upholstery was patched with elastoplast but her black exterior I kept polished to make her deceptively respectable. Even though I had the offer of a better I was loth to part with her. She had seen me through many a cold winter round, had provided me with many a shelter from the icy blasts of diagnostic uncertainty and therapeutic doubt. What though I had perforce to know the whereabouts of every slope in the practice, there to park with some hope of restarting; what though there have been wobbling wheels, a burst tyre, and noises which have brought anxious friends to their windows as I passed; she has carried me through the first turmoils of general practice unscathed. A neighbour remarked that he had seen me with my head in the bonnet so often that he wondered whether I kept a vade-mecum there for reference in difficult cases. Now I sail around the practice in luxury, but in Wordsworth's words, "Where e'er I go, I know that there has passed away a glory from the earth." It was the glory of the unpredictable, of the romantic that the old car so powerfully retained. Abroad I have visited patients by horse-drawn carriage, on donkey-back, by ricksha, and by canoe. Now I fear I will have to shed the last vestiges of romance and settle into civilised urbanity. But there will still be the occasional slack morning when one can cycle the rounds, one's syringes and medicines in the basket, breathing again the pure unconfined air and listening to the yellow-hammers in the hedgerows.

* * *

Aunt Jessie has in her own way solved the problem of old age. Nearing 85, she has wearied of running her small London flat and its domestic difficulties. Some years ago she set about hunting for accommodation she could afford, and quietly, unobtrusively, she found it in Kent. It is a small boarding-house. There are a few permanent guests of ages not dissimilar to her own, but it is run by a woman of culture, patience, and resource. And in the summer there are the guests who come for a fortnight or less and in all of whom Aunt Jessie takes a keen interest. Her room is furnished, and not over-furnished, with her own belongings. From here she still corresponds with some of the acquaintances of long ago and from more recent times. She has few close relations. She invites a friend down now and again. Her small store of worldly goods is often, I suspect, at the service of others, and neither her left hand nor anyone else quite realises how many she helps.

Two years ago when she made the move and when she had already had one cerebral vascular accident and one optic nerve was atrophic with glaucoma, it seemed likely that gradual mental narrowing must follow. But though she herself half prophesied this, her own wit has defeated it, coupled almost certainly with her generous interest in others.

She resists all proposals for holidays away, and it is not easy to circumvent an old lady's determination "not to budge." She refuses to employ a car to take her for even occasional rides; but last weekend she relented. Her vivid imagination had been spurred by the tales of two fellow guests who had been to see the air car-ferry near Lydd. Thither she decided to go, though she spurned all aeroplanes as "modern inventions." Between the administrative buildings and the concrete airways is a small pen for spectators with a narrow concrete wall some 18 in. high supporting a 4 ft. wire fence surmounted by a handrail. On to this wall her frail frame was hoisted, and behind her our arms were linked. For almost an hour we held on. While our limbs were racked by pins-and-needles her one remaining eye darted hither and thither taking in everything.

There was a constant stream of aeroplanes, their fronts opening to reveal two or more cars reversing backwards, or swallowing Continental voyagers between their jaws. No Mediterranean fisher of old was ever more thunderstruck by what entered or emerged from a whale. She debated the possibilities that the cars had not gone far enough into their mechanical gullet. She might, one felt at any moment, issue her own directions as to how the operation SWALLOW should be conducted, and over an hour later a joyous and enlivened octogenerian left the airfield attended by her duller, less spruce, and much younger companions.

* * *

I have long felt that we pædiatricians deal with, potentially, the most litigious age-group of all. Who, having seen one, will not agree that hell hath no fury like the infant unfed, or suffering any other trivial irritation for that matter? On a ward round yesterday I was confronted with an obese red-faced infant, clad only in a nappy, and bawling his head off. He looked for all the world like our old friend Blimp, and I could easily imagine a letter something like this finding its way to a ministerial desk:

Sir,

I recently had the misfortune to spend a period in one of your hospitals. During that time my most reasonable requests were refused or met grudgingly after considerable delay. Despite my loud protests I was frequently left half an hour or more in a state of extreme hunger and when I dropped such meagre articles as were supplied to relieve my boredom little effort was made to restore them. Furthermore, how would the Minister care to sit for an hour in a wet nappy?

I was admitted for the investigation of a little mild vomiting. It took two weeks and much painful bloodletting to discover that I don't vomit, I regurgitate and like it.

I can assure you, Sir, that I shall not let this matter rest. Already, since returning home, I have managed to arouse much local indignation.

I am, &c.

Letters to the Editor

X RAYS AND LEUKÆMIA

SIR,—Towards the end of my wife's third pregnancy our doctor advised an X-ray examination of the abdomen and pelvis. The previous deliveries had been entirely normal and we both felt that there was no real need for the examination. But we sympathised with a doctor called on to attend a doctor who was the wife of a doctor, and we raised no objection. What followed has shown that we were almost certainly wrong.

The films taken included a lateral view of the pelvis, and the radiographer was dissatisfied with the first result, so she took a second lateral film. A week later the report [1] of the Medical Research Council expressed concern at the gonad dose the population was receiving from diagnostic X-ray examinations; and letters in your columns from Dr. Blair Hartley (July 7) and Professor Chassar Moir (July 14) emphasised the very high dose that the fœtal gonads may receive during X-ray pelvimetry. As I read about the possibilities of genetic damage to both mother and child, however, I was no more than uneasy, because we shall probably have no more children and now the alarm had been given, I felt, the child's gonads would be saved from further unnecessary irradiation.

But my uneasiness turned to alarm when I read the report in your last issue by Dr. Stewart and her colleagues. It seems probable that the X-ray examination of my wife has definitely increased the risk of leukæmia in the child. The risk in a particular case, even after irradiation, may not be great; but if this story continues to be repeated, who dare say that the incidence of leukæmia will not be materially increased?

The lessons seem plain: until our fears are proved unfounded, the abdomen and pelvis of a pregnant woman should never be exposed to X rays unless there are very urgent reasons for doing so; and radiographers should be sternly warned that by repeating such examinations on their own initiative they may be doing fatal damage.

M. B.

DISMISSAL ON MEDICAL GROUNDS

SIR,—Dr. Todd's vigorous letter in your last issue does not take account of all the issues involved in medical examinations for employment.

An increasing number of employing bodies now operate superannuation schemes, and medical examination is required to decide whether a new appointee is suitable for admission to such a scheme. From this point of view the ideal appointee is one who will serve well and faithfully, without interruption by illness, until the day he is due to retire, and then, having paid maximum contributions, die before drawing his first quarter's pension. The worst appointee is one who will become unfit for his normal duties at the end of fifteen years or so, will retire on "breakdown pension," and then live on, drawing the pension, to a ripe old age. Some bodies operate sick-pay schemes, and such schemes cannot remain solvent if employees are engaged who will, because of some inherent weakness or disability, be likely to draw much more than the average from the fund. In other cases, employment carries with it an initial period of training, and the employer has to make sure that his employees will not waste the training by breaking down in health as soon as they complete it and begin useful work.

It is perfectly reasonable that an employer should safeguard himself against this type of liability and perfectly ethical that a doctor should carry out medical examinations on the employer's behalf. The case is not greatly different from that of the insurance company

1. See *Lancet*, 1956, i, 999.

which refuses to accept "bad risks" and of the doctor who carries out examinations on behalf of the company.

What Dr. Todd should attack—and in this he has my whole-hearted support—is the system which demands that fitness for admission to a superannuation scheme or a sick-pay scheme should be an essential prerequisite for employment. The registration of disabled persons offers a loophole, since some employers will accept registered disabled persons even if they do not in all respects qualify for superannuation; but on the one hand the quota requirement is small and on the other hand some people with moderate disabilities are reluctant to register.

Employment is an integral part of rehabilitation, and it is very proper for the profession to seek to ensure that the sick and the disabled can find or retain appropriate work. It should be possible for the not-quite-fit to enter employment without participation in the normal sick-pay and superannuation fund; the financial consequences of their breaking down in health might be covered out of State funds (as, in fact, it is already partly covered by National Insurance). Dr. Todd might contend that among the offenders are certain State departments, local authorities, and public corporations. On this, I would agree that there is a moral obligation upon such bodies to lead the way and become model employers. In the Welfare State it should not be at all difficult for them to do so.

Public Health Department, Colchester. JOHN D. KERSHAW.

SIR,—Complaints that an employer dispensed with the services of a person who has been injured, or has been found to suffer from some potentially (or actual) handicapping lesion are extremely common in the experience of boarding medical officers implementing the provisions of the Industrial Injuries Acts (1946–53). 99% of those who disclose this fact do so voluntarily. Obviously, the reasons for the dismissal are multifarious. Few claimants display overt resentment.

One important factor needs forceful reiteration. Are doctors "label-conscious" when writing a diagnosis or a certificate? Do we realise just how literally, how seriously, how uncritically, our quickly written diagnostic labels are "taken" by the lay authorities? Just how completely damning, and how "permanently" damaging these (to us) familiar sentences may be, is really quite frightening!

Dr. X, an experienced *senior* general practitioner, favoured the use of "Myocarditis" on the many occasions when the heart was involved: the term satisfied his clinical conscience, no doubt, and the patient either did not bother to read what was written on the certificate, or maintained she could not decipher it? Alas, the ball started to roll! Next time the patient attended, a locum referred to the form E.C.6, and an identical "label" appeared on the certificate. Over the years (the patient is a lady still under the age of 50) Dr. X has always thought of her as a sufferer from "myocarditis." The evidence for this is his repeated use of the same term.

If the patient concerned, a Civil Servant, had not aspired to the status of "establishment," no hardship might have ensued. That the examining officer could not ignore a record of many periods of sick-absences, each sanctioned by the stigma of "myocarditis," is plain. *The official record, studded with recurrent identical diagnoses, set a profile of inescapable cardiovascular defect*, and the oft-repeated labels, deprived this middle-aged spinster of privileges and security. (The fact that innumerable electrocardiograms and cardiological opinions completely failed to confirm any facet of the "diagnosis" is officially irrelevant.)

This example is one of many encountered in this sector of medical practice. Responsibility for setting the plan of future opportunity is thus often inextricably bound with certification. Wherever constitutional involvement might prejudice employability, or potential disablement threaten a status of acceptance, our duty is clear. Not all the possible implications can be envisaged on every occasion, but the use of terms and labels must always avoid irreversible conclusions. Who knows? The best may be yet to be! Dr. Todd sounds a note of salutary warning. Unless we do a stint of heart-searching, it may well be that the boomerang of careless ("anything will do") certification of the ailments and disabilities of our fellow-beings will rebound to our own discomfort and displeasure.

"Do not mask your words in a semblance of truth . . ."
—DANDEMIS.

Lytham St. Annes, Lancashire. E. GRAHAM ELWELL.

RESPONSIVENESS TO ORAL HYPOGLYCÆMIC AGENT

SIR,—In the course of a study of sulphanyl-*n*-butylurea (B.Z. 55, carbutamide), an oral sulpha preparation, on a series of 17 diabetic patients, it was thought advisable to devise a method of testing the patients' sensitivity to the hypoglycæmic effect of this drug. The test saves time, effort, and money, and avoids prolonged useless administration of this potentially toxic agent to patients who do not respond to it, and whose sensitivity to insulin, we find, unfortunately decreases after long-continued administration of this drug.

The fasting blood-sugar level of the patient is determined. Sulphanyl-*n*-butylurea 1 g. is then given orally with a glass of water and the blood-sugar level is traced hourly for four hours. Patients sensitive to the drug show the maximum hypoglycæmic effect after four hours; and in practice the test could be carried out with two blood specimens only—a fasting one, and another four hours after the administration of the drug. In some cases it has been found advisable to test the hypoglycæmic effect of a bigger dose (2–3 g.).

This test, combined with our clinical observations, enabled us to classify our 17 patients into three groups:

Group A (10 patients [59%]).—In this group the blood-sugar level four hours after the test dose was much below the fasting level. Of these 10 patients 9 continued to respond to sulphanyl-*n*-butylurea, and their sensitivity to insulin improved during the administration of the drug. The 10th patient did not continue to respond.

Group B (6 patients [35%]).—In this group the blood-sugar level did not drop below the fasting level during the four-hour test period; and in 2 cases an initial hyperglycæmia was noticed two hours after the test dose. These patients did not respond to sulphanyl-*n*-butylurea, their sensitivity to insulin was slightly or moderately lowered, and the drug had to be discontinued.

Group C (1 patient [6%]).—In this case the blood-sugar level showed a slight drop after four hours. Treatment with sulphanyl-*n*-butylurea alone failed completely, but in combination with insulin it reduced the patient's basic requirements of insulin from 240 units to 90 units daily. He needed a large maintenance dose (3 g. daily) of sulphanyl-*n*-butylurea.

Alexandria University, Egypt. M. H. GHANEM
MAURICE N. MIKHAIL.

CARDIAC PAIN FROM ŒSOPHAGEAL LESIONS

SIR,—In his paper published on June 9, Dr. Geoffrey Bourne rightly emphasised that in every case of anginal pain one should consider the possibility of an œsophageal lesion. Not long ago I too saw a case in which an œsophageal ulcer was responsible for symptoms attributed to stenocardia; but it is perhaps not less interesting to mention here two cases showing the problem from another point of view.

Both patients were over 50 years of age and had histories of ulcer of the œsophagus (proved by radiography) lasting for several years with periodical, typical pains. Three years after the discovery of the ulcer the first patient had an attack of precordial pain, which differed but slightly from the symptoms of the former attacks. Electrocardiography showed an acute anteroseptal infarction of the myocardium.

Coming for routine examination shortly afterwards the second patient complained that besides his usual pains in the chest, he had for two or three days had shortness of breath. An E.C.G. showed acute damage of the anterior wall.

In a community (*kibbutz*) of 500 persons we saw within three months one case with stenocardial pains due to œsophageal ulcer (E.C.G. normal) and two cases of myocardial infarction in patients with œsophageal ulcer. Is this association purely fortuitous, or are the two conditions different expressions of neurovegetative disorders? In any case it is worth pointing out that not only may anginal pains originate from œsophageal ulcer (as Dr. Bourne has shown) but also myocardial infarction should be considered in pain attacks of patients with verified ulcers.

All information (e.g., X-ray pictures, electrocardiograms) may be obtained, if desired.

Haifa, Israel. GEORGE GUTTMANN.

PRODUCTION OF ABNORMAL BACTERIA SOME POSSIBLE ANALOGIES WITH FORMATION OF TUMOURS

SIR,—As single cells possess the same function as multicellular organisms—i.e., ingestion, assimilation, disintegration, reconstruction, and responses to stimuli—and as conclusions about unicellular forms of life can be applied to all classes of cells,[1] it is permissible to compare the mechanism of the production of tumour cells with the mechanism of production of abnormal forms of bacteria.

Numerous workers have noted the presence of abnormal giant forms of bacteria in vitro, produced by a wide range of apparently unrelated stimuli,[2–5] and some of these forms are often seen in vivo under conditions unfavourable for the organism. From these abnormal forms new races of bacteria are produced, more resistant to the stimulus which induced them. Similar phenomena occur with the yeasts under a variety of stimuli, including some well-known carcinogens.[6]

For some years now, whilst investigating the respiratory activities of aerobic and anaerobic bacteria, I have observed that the stimulus to abnormal cell formation is hydrogen peroxide, either alone or combined with absence or diminution of the amount of catalase present in or around the cells.

Anaerobic bacteria (16 species examined) growing at the top of the column of growth in shake cultures—where hydrogen peroxide is produced and catalase is absent [7 8]—always exhibit abnormal metabolism. There is active growth, with production of abnormal giant forms.

Aerobic bacteria (20 species examined), grown as shake cultures in poor media where they are unable to synthesise enough catalase to grow aerobically, become sensitive to oxygen and behave as micro-aerophilic organisms growing as discs below the surface. If they are incubated anaerobically, no discs appear until the culture is removed to an atmosphere containing oxygen. At the disc level, abnormal forms, many quite unrecognisable as belonging to the parent organism, are always to be found even as long as four months after incubation. Between the level of growth and the surface of the medium, the cells become swollen but do not multiply. (The analogy in animal cells would be cloudy swelling.)

Furthermore, if the columns of media containing aerobic or anaerobic bacteria are topped with hydrogen peroxide, the level of growth is depressed according to the concentration of hydrogen peroxide used. With both types of organism, catalase placed at the tops of such columns abolishes this phenomenon.[9]

We know that hydrogen peroxide is mutagenic in bacteria [10] and probably in neurospora and drosophila too.[11] We also know that mutagenic substances are usually carcinogenic,[12] and this brings me to some possible analogies with tumour formation in animals.

As most living cells contain catalase, one of the most active enzymes known to man, and as their catalase content and respiratory activity are intimately related, it is probable that changes similar to those seen in bacteria can occur also in animal and probably plant tissues.

Many years ago Warburg [13 14] brought forward strong evidence that the carcinoma cell, as compared with the normal epithelial cell, behaved like an anaerobe. Like bacterial forms which are abnormal, tumour cells in general are less dependent on their oxygen supply.[15] Greenstein [16] has shown that all tumours—regardless of ætiology, histogenesis, or species wherein found—are (like most anaerobes and some micro-aerophilic organisms) deficient in catalase and the cytochrome system, and furthermore that in the liver and tissues of tumour-bearing animals the level of catalase is low. May this not account for the continued propagation of the abnormal cells?

If the catalase content of a cell or collection of cells is markedly reduced in vivo, in its normal environment of oxygen, or if its catalase content remains normal though the concentration of oxygen is markedly increased, we should have exactly the conditions for the stimulation of abnormal cell-growth. It is a fact that the concentration of catalase in nuclei is very low [17]; thus if the catalase concentration in the cell cytoplasm is decreased there will be an enhanced stimulation of the nucleus by oxygen. Furthermore, it has often been suggested that the form in which oxygen is presented to the cell is hydrogen peroxide; and there is no doubt that hydrogen peroxide is formed in a number of enzyme systems.[18]

As with the production of abnormal forms in bacteria, we find that a wide range of apparently unrelated stimuli can induce tumours in animals. The only common denominator appears to be the cell upon which they act. We know that in rat fibroblasts malignant change can be induced in vitro by intermittent anaerobiosis.[19] We know that ionising radiations in high dosage can kill cells but in low dosage can stimulate their growth. We know that hydrogen peroxide is probably formed when these rays pass through pure water and more so if they are passed through organic solutions,[20] and also that some of these rays (particularly X rays) can destroy catalase.[21] Does not this explain why malignant cells—which are already deficient in catalase and abnormally sensitive to oxygen—are so easily killed by overoxidation in this manner? It is also known that with some of the chemical carcinogens there is a close relation between carcinogenic and photodynamic action, the active factor here being the production of hydrogen peroxide.[22]

In animals if certain of the endocrine glands are removed the catalase content of the liver is considerably diminished but can be restored to normal by injecting testosterone or cortisone.[23] May this not explain [the

1. Cameron, G. R. Pathology of the Cell. Edinburgh, 1952; p. 587.
2. Wahlin, J. G., Almaden, P. J. *J. infect. Dis.* 1939, **65**, 147.
3. Gordon, J., Gordon, M. *J. Path. Bact.* 1943, **55**, 63.
4. Klieneberger-Nobel, E. *J. gen. Microbiol.* 1949, **3**, 434.
5. Dienes, L., Weinberger, H. J. *Bact. Reviews*, 1951, **15**, 245.
6. Scherr, G. H., Weaver, R. H. *Ibid.* 1953, **17**, 51.
7. Gordon, J., Holman, R. A., McLeod, J. W. *J. Path. Bact.* 1953, **66**, 527.
8. Holman, R. A. *Ibid*, 1955, **70**, 195.
9. Holman, R. A. *Nature, Lond.* (in the press).
10. Wyss, O., Stone, W. S., Bennett Clark, J. *J. Bact.* 1947, **54**, 767.
11. Sobels, F. H. *Nature, Lond.* 1956, **177**, 979.
12. Strong, L. C. *Brit. J. Cancer*, 1949, **3**, 97.
13. Warburg, O. *In* International Contributions to the Study of Cancer. Philadelphia, 1931; p. 70.
14. Warburg, O. Metabolism of Tumours. London, 1930.
15. Cameron, G. R. Pathology of the Cell. Edinburgh, 1952; p. 103.
16. Greenstein, J. Biochemistry of Cancer. New York, 1947; p. 201.
17. Dounce, A. L. *In* Cameron's Pathology of the Cell (ref. 1), p. 137.
18. Baldwin, E. Dynamic Aspects of Biochemistry. London, 1952; p. 167.
19. Goldblatt, H., Cameron, G. R. *J. exp. Med.* 1953, **97**, 525.
20. Bacq, Z. M., Alexander, P. Fundamentals of Radiobiology. London, 1955; p. 107.
21. Forssberg, A. *Nature, Lond.* 1947, **159**, 308.
22. Blum, H. F. Photodynamic Action and Diseases caused by Light. New York, 1941; pp. 32, 97.
23. Adams, D. H. *Biochem. J.* 1954, **56**P, 26.

rationale of the modern methods of treating malignant disease?

As Greenstein [24] says, "It is no doubt quite far fetched to draw an analogy between animal tumours and a micro-organismal mutant but it is possible that the mechanism involved in the alteration leading to both and the adaptations and adjustments required in both may not be entirely dissimilar." This is in keeping with the theory of carcinogenesis suggested by Haddow.[25]

Since bacteriophage can stimulate formation of abnormal micro-organisms, and since it is well known that hydrogen peroxide can induce production of bacteriophage and is mutagenic,[26] it is altogether probable that in shake cultures at the disc level, where there is an optimum balance between catalase and hydrogen peroxide, the conditions for phage induction are present, providing a continued stimulus for the propagation of abnormal forms and the production of new mutants. (If the organisms in the discs are subcultured and the new bacteria put up in an identical system, it is found that the discs grow much nearer to the meniscus; and, if this is repeated, strains can be produced progressively more resistant to the stimulus which induced them.) Similarly, in animal cells, under the stimulus of peroxide with an optimum amount of catalase, a new particle might be formed, endowed with genetic continuity as postulated by Lwoff [27] which in turn is responsible for the continuation of the neoplastic state.

I believe that this method of stimulation of abnormal cell-growth in bacteria, in animal cells, and probably in plant cells too, is a fundamental biological phenomenon, and one which will repay close investigation by many workers in many fields.

Professor Woodger [28] has remarked that the only hypotheses we need be afraid of are those which do not have testable consequences. A hypothesis of tumour formation based on this mechanism should be directly testable.

Institute of Pathology,
Royal Infirmary,
Cardiff.

R. A. HOLMAN.

FIBRINOLYSIS AND LIPÆMIA

SIR,—Dr. H. B. W. Greig's inference that intravascular thrombi are disposed of more often by fibrinolysis than by the textbook mechanism of organisation and recanalisation is in keeping with experimental [29] and clinical evidence.[30] It has been shown that fibrinolysis proceeds rapidly when the thrombin concentration is reduced,[29] and the speed of restitution of phlebothrombotic channels on dicoumarol or heparin therapy makes us presume that fibrinolysis is the usual mechanism.

The further implications of his report on the effect of alimentary lipæmia on the rate of fibrinolysis (July 7) merit discussion. It is noteworthy that, whereas postprandial lipæmia from corn oil did not retard fibrinolysis, lipæmia from eggs did retard it. We have reason to believe that the lipid material affecting fibrinolysis is the lecithin. At any rate, we have found that fibrinolysis in vitro (induced by dilution or by heparin) is inhibited by emulsions of crude soybean oil, or purified soybean lecithin, but not by emulsions freed from phospholipid. What led to this finding may be instructive.

For some years we have been examining substances which may reverse the toxicity of the "antifolic" aminopterin in weanling rats. Our reason for this screening is not that we wanted to use this virulent rodenticide against human neoplastic disease but rather that we have found it to duplicate the effects of radiation—as noted also by others.[31 32] Among protectants against radiation sickness are sources of unsaturated fatty acids,[33] and in keeping with this we have been able to confer considerable protection on weanling female rats (given 10 μg. of aminopterin per day) by adding 50 mg. of soybean lecithin to their daily diet. During this study we noticed that while the unprotected rats developed severe melæna, those given soybean supplement did not.

It was also known that aminopterin-poisoned rats develop a terminal "hyperheparinæmia." Whether the source of this heparin is the mast-cells (which we have not been able to find), or more probably sulphated mucopolysaccharides from depolymerisation of ground-substance, has not been determined. But the terminal plasma shows a very high antithrombin content to which the melæna is partly attributed. This plasma can be made to clot by saturating it with lecithin.

It was then found that heparin or any heparinoid was chemically incompatible with lecithin—that the latter was in fact a macrocationic material which would neutralise the macroanionic heparin just as does protamine, globin, or toluidine-blue.[34]

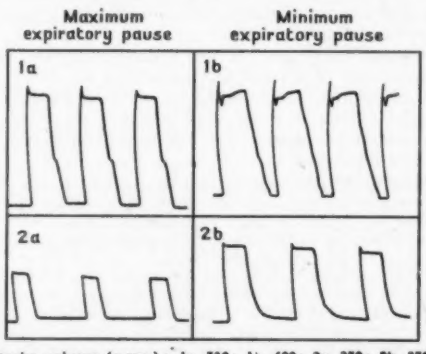
If, as has been assumed, heparin is the physiological depolymerase-inhibitor of blood and tissues,[35] lecithin may be its physiological antagonist. If the lipæmic inhibition of fibrinolysis described by Dr. Greig is indeed due to lecithinæmia, we may reasonably speculate on the existence of a homœostatic mechanism with a wide range.

Laurelton, Long Island,
N.Y., U.S.A.

ROBERT D. BARNARD
JAMES F. BARNARD.

INTERMITTENT POSITIVE-PRESSURE RESPIRATION

SIR,—Lawes and Harries, in a thought-provoking article,[36] commented on the airway pressure pattern of the Radcliffe pump. Sandiford and McDonald [37] also referred to this factor and to the "finger-tip pressure" method of intermittent positive-pressure respiration which they felt to be inadequate, largely on grounds of flow starvation. Lawes and Harries [38] did not agree with the latter comment.



Stroke volume (c.cm.): 1a, 500; 1b, 600; 2a, 250; 2b, 350.

The pressure patterns obtainable with the Radcliffe pump (fig. 1a and b) show inspiration/expiration-plus-pause ratios from 2 : 3 to 4 : 3 at working stroke volumes. A simple adaptation (particulars of which will be sent on application to our unit) gives an additional range of ratios from 1 : 2 to 1 : 4. The pressure patterns obtained are shown in fig. 2a and b; they were taken from the airway of an anæsthetised child.

24. Greenstein, J. Biochemistry of Cancer. New York, 1947; p. 215.
25. Haddow, A. *In* Chemical Induction of Cancer, by G. Wolf. London, 1952; p. 120.
26. Lwoff, A. *Bact. Reviews*, 1953, **17**, 281.
27. Lwoff, A. *Ibid*, p. 324.
28. Woodger, J. H. Society for Experimental Biology: Symposium no. 2. London, 1948; p. 361.
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30. Barnard, R. D. *N.Y. St. J. Med.* 1948, **48**, 231.
31. Grampa, G., Dustin, P. jun. *Rev. belge Path.* 1952, **22**, 113.
32. Vitale, J. J., Zamcheck, N., DiGiorgio, J., Hegstead, D. M. *J. Lab. clin. Med.* 1954, **43**, 583.
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34. Barnard, R. D. International Symposium on Macromolecules, Rehovot, April 11, 1956.
35. Glick, D., Sylven, B. *Science*, 1951, **113**, 388.
36. Lawes, W. E., Harries, J. R. *Lancet*, 1956, **i**, 783.
37. Sandiford, H. B. C., McDonald, I. *Ibid*, p. 1014.
38. Lawes, W. E., Harries, J. R. *Ibid*, July 14, 1956, p. 100.

The components, which Mr. J. Finney and Mr. R. Manning of St. Mary's Hospital, Portsmouth, have made for me, are simple and robust: they have run on test bench for about three weeks and in clinical use for about 400 hours.

Portsmouth Poliomyelitis Unit, Infectious Diseases Hospital, Milton Road, Portsmouth. I. R. McDONALD.

THE BACTERIOLOGIST IN MEDICINE

SIR,—Several universities now provide special degree courses in bacteriology, but the science graduates thus produced have no idea where they stand in regard to the medical profession.

There are several points to be considered here. For instance, many hold that, in relation to medical practice, bacteriology is declining in importance with the advent of new drugs; but it may on the other hand be said that drug resistance is so common that "vigilance" over pathogenic organisms must on no account be relaxed. Another point is that virus diseases, in which these science graduates are now given longer courses, are assuming more and more medical significance. However, the main question is whether the medical world is prepared to make use of these ready-trained bacteriologists for medical research, or is going to rely on medical men, who have to learn most of their bacteriology and virology after qualifying in medicine. If non-medical graduates are employed in medicine, any person with a real bent towards bacteriological and virological research will be saved the necessity of doing a six years' medical course beforehand; and also he would not need to waste his university training by working as a technician in a public-health laboratory—a position whose sole advantage, as far as this argument is concerned, is that it has a medical aspect.

In short, should a university-trained bacteriologist avoid medical bacteriology unless he possesses a medical degree?

Carmarthen, West Wales. Q. D. MACGARVIE.

INFANTILE PYLORIC STENOSIS

SIR,—I was interested in Dr. Laron's letter[1] on the ethnographic factor in the ætiology of infantile pyloric stenosis.

Hypertrophic pyloric stenosis has never been reported in an Australian aborigine. An inquiry in 1953 as to any cases having been observed but not reported elicited no response.[2] I have seen the condition in a 9-week-old child whose mother was quarter-caste and father of Irish descent.

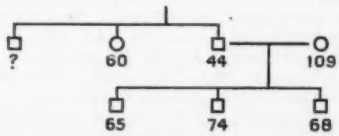
Perth, Western Australia. JAMES WATSON.

THE FAMILIAL INCIDENCE OF LOW PSEUDOCHOLINESTERASE LEVEL

SIR,—Dr. Lehmann and Miss Ryan (July 21) have drawn attention to the low pseudocholinesterase level in siblings of some patients in whom a low enzyme level had been found when their blood was investigated following apnœa after the administration of suxamethonium. They suggest that on the basis of present knowledge the low value is associated with a recessive gene.

We had previously had the opportunity of investigating one family, in which the inheritance did not appear to be due to a recessive gene.

The normal range for serum pseudocholinesterase by the method used in this laboratory is from 81 to 150 units, with a mean of 102 units, and standard deviation 17 units. The patient (a man aged 53), who had prolonged apnœa following tonsillectomy, was found to have a low value for pseudocholinesterase (44 units) on repeated occasions, and no liver disease or other reason for this was discovered. The values found in the members of the family may be shown as follows:



The values for the patient's sister (aged 55) and all three sons (aged 22, 19, 17) were all below our normal range, though not as low as those found in the patient himself; in fact they appear to be roughly halfway between the level in the patient's serum and that in his wife's. We would like to suggest that in this family the gene responsible is dominant, and that the patient himself is homozygous, showing a double-dose effect, and the remaining affected individuals heterozygotes, with only a single dose.

In all the people examined the red-cell enzyme was normal: detailed blood-grouping was also carried out on all the family, but did not shed any light on the inheritance.

Our thanks are due to Dr. J. D. Buxton, who referred the patient to us, and to Dr. K. J. Randall, who arranged for the collection of blood samples from all the patient's relatives.

Lewisham Group Laboratory, London, S.E.13. E. N. ALLOTT
J. C. THOMPSON.

G!

SIR,—Your correspondent who reports last week (p. 471) some interesting experiments in the United States on "weightlessness" during aeroplane dives, makes some misleading and erroneous statements.

The human centrifuge can be used to select persons with good tolerance to "positive acceleration." It is possible that such persons have a superior tolerance of weightlessness. But the centrifuge is certainly not capable of making us weightless. The centrifuge simply adds a centrifugal acceleration to the continuing acceleration due to gravity. Gravity is not neutralised, and in fact the resultant acceleration in the centrifuge always exceeds that of gravity. The gravitational pull in the long axis of the body is abolished on lying horizontally. Gravity then acts transversely, and although some of its effects, particularly on the cardiovascular system, are reduced, weightlessness is not achieved. But the lying subject approaches weightlessness more nearly than a subject under any conditions in a centrifuge.

Weightlessness is achieved in the Earth's gravitational field during a free fall in a vacuum. In the Earth's atmosphere, an aeroplane in a carefully calculated power dive must be used to reproduce this rate of fall, as in Dr. Gerathewohl's experiments.

During the weightless state, contrary to your correspondent's statement, the subjects did not lose consciousness. Dr. Gerathewohl stated (Proceedings of 20th International Physiological Congress, p. 1033) that "the majority of subjects felt fine during the state of practical weightlessness, did not observe any adverse effects but enjoyed the strange situation including the changes of acceleration between the weightless phases." Other subjects reported neither pleasant nor adverse effects, but sensations of motion such as falling, being rotated or suspended in mid air. A third group reported discomfort and showed symptoms of nausea and vertigo typical for attacks of motion-sickness.

One can only suppose that in referring to unconsciousness, your correspondent confused the slight reactions during the weightless state with the severe reactions during a sharp pull out from a fast dive. Under the latter circumstances the subject, far from being weightless, becomes temporarily several times his normal weight, and the circulation to the eyes and brain becomes temporarily inadequate.

Weightlessness cannot, of course, be countered by a pressure suit. "Artificial weight" can, however, be supplied in outer space by centrifugal means. If

1. Laron, Z. *Lancet*, 1956, i, 1074.
2. Watson, J. *Med. J. Aust.* 1953, ii, 242.

the vehicle is made to rotate, weight is experienced and its magnitude depends on the speed and radius of rotation. Artificial weight will probably be a convenience rather than a physiological necessity.

Pressure suits will be required by travellers who emerge from vehicles in space. An entirely different type of pressure suit—namely, an anti-*g* suit—may be required to protect travellers during the acceleration and deceleration at the start and end of their journey; it is, however, possible that lying at right angles to the direction of acceleration will afford sufficient protection.

Department of Physiology,
Queen's University of Belfast. A. D. M. GREENFIELD.

SIR,—It is regrettable that the note on *g* effects by your correspondent should betray such misunderstanding of the nomenclature, albeit in a humorous vein. At the risk of seeming to be something of a spoil-sport I feel that the following facts are perhaps worth mentioning.

For the physiologist a *g* force is definable as positive or negative by virtue of bodily orientation in the gravitational field. Thus, it is positive when acting in a footwards direction and negative when applied headwards. The numerical value of the force is of course quite unaffected by the attitude of the subject. In a human centrifuge it is no more possible to create zero gravity conditions, as your correspondent would have us believe, than it is possible to achieve that end by just standing on one's head.

The animal centrifuge experiments referred to have little if any bearing on zero gravity problems. Moreover, a surprising thing about rats born and bred under 3*g* conditions is that they are so very normal. There is so far no evidence of "phenomenal" muscular and nervous development.

National Institute for
Medical Research,
London, N.W.7. J. A. ARMSTRONG.

ENGLISH FOR DOCTORS

SIR,—On opening last week's issue I was horrified to see on p. 421 in the title of an original article, the term "skin rash." While I am accustomed to mothers who bring children to my outpatient department from the areas behind Victoria Station remarking—"'e's got a skin rash, doctor," my students never use this phrase in my presence more than once. "Skin eruption" and "rash" may be used according to taste, skin rash surely never.

London, W.1. JOHN FRANKLIN.

PROLONGED CHEMOTHERAPY IN TUBERCULOSIS

SIR,—The theory and, worse luck, the practice of "prolonged" chemotherapy has so infiltrated our work in tuberculosis that I am impelled to send this note of protest.

I am reminded of the days when "authority" declared that artificial pneumothorax treatment must be maintained for *at least* five years; and when I tried, before the war, to raise my voice against this "prolonged" therapy by collapse methods, I was—politely—told to shut up. I tried to point out that the "natural" healing of a tuberculous infiltration was, on the average, $1^1/_2$ to 2 years, and that the assistance of a pneumothorax should not be prolonged if the function of the lung was not to be lost. One only has to see such a case—post mortem—to understand this loss of function.

The development of A.P. clinics, and the mass suggestion accompanying this form of treatment, provided us with a regular control of our patients who, having been given a crutch, would go pale at the mere suggestion that the treatment could be stopped; and, unfortunately, these clinics became like the surgeries of general practitioners, the A.P. refill taking the place, most effectively, of the bottle of medicine.

In short, we have witnessed in the last 25 years, a jolly good method of treatment misapplied, misused, abused, and thrown to the dogs.

And now—with the aid of the biochemists, the manufacturing chemists, and the diverted loyalty of medical authority—we have sold ourselves to the very devils who are tying us hand and foot to the drugs. *Prolonged* chemotherapy: and I have even heard that it might be continued "for life."

Of course, they are marvellous these drugs—and it is not wrong to say that one of the greatest inventions of the 20th century was penicillin—and we have to admit that with chemotherapy the activity of the tubercle bacillus can be so abated that surgery can be undertaken now, when it could not have been before. But that is *wise* use of the drugs—a *temporary* measure—which appeals to one's sense.

If we go on our present way, we become unworthy to make decisions, and the decision we have to make is when to *stop* our treatment. Even as we did damage with artificial pneumothorax treatment prolonged ad lib, we are going to do even more damage with our abuse of the drugs, not only to the lungs we are trying to treat, but to livers, spleens, stomachs, kidneys, thyroids, and all the other organs of the body which, poor things, are not asking for this ill treatment.

Kingston Chest Clinic,
Kingston-upon-Thames,
Surrey. SINCLAIR R. WILSON.

THE UNRECOGNISABLE TABLET

SIR,—I thank Dr. McQuitty and Dr. Loudon (Sept. 1) for their helpful advice to have one's own drugs labelled with their proper names. But this still does not solve the problem of unidentifiable tablets prescribed by hospitals or other doctors. I am grateful to S. B. in the same correspondence for a case in point. The only hope is perhaps that we may start a national campaign for identity marks, which need not be in full. Any doctor should find P.$^1/_2$, R.A.S., or Ac.Sal. a sufficient clue. It would be more helpful still if P.$^1/_2$ or P.1 were stamped on the tablet.

Walmer, Kent. JAMES S. HALL.

THE TUTORIAL SYSTEM

SIR,—One of the leit-motifs of your Educational Number (Aug. 25) was the desirability of developing the "tutorial system" in clinical medicine. This theme has now for a long time been a recurrent one in English writings on medical education, and is largely inspired by nostalgic memories of the success of the system at "Oxbridge." But educational techniques rarely lend themselves to successful literal translation to a different medium. And the attempt to do so in medicine runs the risk of obscuring the concept that the equivalent of the "Oxbridge" tutorial system in clinical medicine is the responsible clinical clerkship and dressership. Properly used (and an essential is that numbers shall be small) responsible clinical clerkship and dressership provide almost the ideal medium for the attainment of the university objective—the development of informed and responsible individuals. And by the opportunities for the two-way exchange of ideas that these appointments afford, with the chief of the firm in the position of "senior tutor," they are capable of all that under different conditions the "Oxbridge" tutorial system achieves. (Incidentally, this concept solves the long vexed problem of the definition and position of a general physician or surgeon in a teaching hospital—namely, "a physician or surgeon who uses his specialised knowledge to elucidate and convey the general principles of medicine.")

London, W.1. DAVID PATEY.

THE FINAL EXAMINATION

SIR,—I have read with great interest Professor Bull's paper (Aug. 25), in which he casts doubt on the value of final examinations in medicine.

He views with some favour what he terms multiple-choice questions. May I quote the example he gives?

> You are called at midnight to a previously well-balanced diabetic patient who has been receiving 20 units of insulin twice daily. The patient is unconscious. There are no abnormal neurological signs except for extensor plantar responses. Urine passed 3 hours previously contains glucose + + and gives a faintly positive Rothera's test. The correct procedure is :
>
> 1. Inject 40 units of insulin.
> 2. Inject 50 g. glucose intravenously.
> 3. Do a lumbar puncture to see if the cerebrospinal fluid contains blood.
> 4. Take a sample of blood for glucose estimation before deciding on treatment.

Although the brief details available suggest hypoglycæmia as the most likely cause of the loss of consciousness, surely a careful doctor—or indeed medical student—would insist on a thorough clinical examination before reaching a vital decision regarding treatment. As set, the question seems to cater for only three possible diagnoses out of the many which might produce unconsciousness in a patient, whose age, sex, and previous history are undisclosed.

London, S.E.1. J. J. CONYBEARE.

A PLASTIC SURGICAL MARKING-INK

SIR,—The need for a surgical marking-ink that is proof against preoperative preparation of the skin has long been felt, particularly in varicose-vein surgery. Numerous formulæ have been mooted, but in my hands all have supplanted their initial success by failing me on the very occasion when skin marking has been most vital and crucial.

With the introduction of 'Nobecutane' plastic dressing,[1] so easily applied by brush or rod, it occurred to me that at last we had in our grasp the ideal vehicle for a coloured surgical marking-ink, and in concert with Dr. R. Powell of the medical division of Evans Medical Supplies some clinical experiments were made to determine the best dye to incorporate in this liquid plastic medium. Cellaquer-blue appeared to suit our purpose best, and when mixed with nobecutane it forms a plastic ink which withstands rigorous skin preparation and stands out boldly in colour relief. It is simple to apply, dries rapidly, and is proof almost against shaving! It can be used with confidence at any time under twenty-four hours before operation, whilst after operation it will peel off in a few days.

I understand that it is now available from Evans Medical Supplies Ltd. under the name of 'Nobecutane Marking Ink.'

London Varicose Clinic, London, S.W.11. STANLEY RIVLIN.

SHORTAGE OF MIDWIVES

SIR,—That the future maternity services depend on adequate numbers of trained midwives is obvious. Today there is growing apprehension among obstetricians up and down the country concerning the recruitment of pupil midwives. One hears of the closure of wards and of the understaffing of beds. The latter is perhaps the greater evil, leading sooner or later to outbreaks of infection among both patients and staff.

The majority of pupil midwives are recruited from the "recently qualified" State-registered nurses, and it is from this source that an improvement in recruiting should be sought. I feel that the time has come for those concerned with the present arrangements for the training of nurses and midwives to take a new look at the whole problem.

I suggest that the State-registered nurse should have had some practical acquaintance with midwifery before entering for her final State examination. At present her syllabus requires her to have had eight lectures on obstetrics and gynæcology, but her training-school is unable to provide her with practical experience in midwifery. Would not a short time spent in a maternity hospital make her a more complete nurse than at present? This introduction to midwifery might stimulate her interest in obstetrics and arouse an ambition to become a pupil midwife after she has taken her final State examination. Undoubtedly the ease with which a newly fledged State-registered nurse can obtain a staff nurse's appointment (and pay) is an attraction to many who feel that to become a pupil midwife is synonymous with becoming a junior "pro" again.

The General Hospital, South Shields. TERENCE G. ROBINSON.

1. Ellerker, A. G. *Lancet*, 1955, i, 200.

INTRASPINAL EPIDERMOID TUMOURS

SIR,—In your last issue Professor Choremis and his colleagues suggest that tuberculous meningitis and repeated lumbar punctures may give rise to the rare epidermoid tumour which sometimes occurs within the spinal theca. Their five cases in children between the ages of 7 and 12, all of whom had from three to seven years previously been treated successfully for tuberculous meningitis and had had repeated lumbar punctures, led to their conclusion that the spinal tumours may have arisen from implanted epithelial cells. Epithelial cells implanted in this way some years before the appearance of these tumours may be the origin of some of them, but that this is not always the explanation may be concluded from a case which we have had here recently.

A little boy aged 6, except for attacks of measles and chickenpox, had been a perfectly healthy child until five months before his admission when he began to drag his feet when walking. He was referred by Dr. G. Petty to the care of my colleague, Dr. J. D. Spillane, who found sensory changes accompanying a spastic paraparesis. Myelography showed a lesion at the level of the first thoracic vertebra, and at laminectomy an opaque, white, epidermoid intrathecal and extramedullary tumour, weighing 3·5 g. was removed with the subsequent recovery of the child.

A point of interest in these cases in children is the normal cerebrospinal fluid, or one in which there is only a slightly raised protein content, obtained on lumbar puncture. This was so in our case and in three of the five Greek cases.

I should like to congratulate Dr. Choremis and his colleagues in the pædiatric clinic and polyclinic at Athens on their remarkable series of these rare tumours.

Surgical Unit, The Royal Infirmary, Cardiff. LAMBERT ROGERS.

THYROIDECTOMY AND THE RECURRENT LARYNGEAL NERVES

SIR,—It takes some weeks for your journal to reach these shores and there is further delay before it is reviewed here. Hence the tardiness of this comment on the paper by Roy, Gardiner, and Niblock.[1]

The high percentage of recovery, or effective compensation, following damage to the recurrent laryngeal nerves found in their series of thyroidectomies is of considerable interest. However, the number of patients in whom the nerve was damaged might have been substantially decreased by the practice of routine exposure of the nerves at operation. Their technique of thyroidectomy is evidently exactly that used by Joll[2]; and, however

1. Roy, A. D., Gardiner, R. H., Niblock, W. M. *Lancet*, 1956, i, 988.
2. Joll, C. A. Diseases of the Thyroid Gland. London, 1932.

great an exponent of thyroid surgery he was, it would be wrong to suggest that there has been no progress since. It is true that in rewriting the second edition of his book [3] I left the chapter on the technique of thyroidectomy largely unchanged, and this was a small tribute to the excellence of his work in this field. Nevertheless in the preamble it was emphasised that deliberate exposure and preservation of the recurrent nerves had become accepted practice, and that, contrary to earlier fears, ordinary surgical dissection of the nerves itself caused no damage.

Increasing experience has abundantly confirmed these views, and in almost all of the leading clinics now the nerves are exposed and given a wide berth. Thus can be eliminated the complication whereby 3% of patients are left husky, or with voices of brassy quality, easily tired, and with inspiratory stridor.

Unit of Clinical Investigation,
Royal North Shore Hospital,
Sydney, Australia. F. F. RUNDLE.

*** In view of Dr. Rundle's first paragraph, we should perhaps mention that our airmail edition can be read in Sydney a few days after publication.—ED. L.

TEACHING OF MEDICINE

SIR,—It has always amazed me that the majority of those writing and talking the most about medical education are (1) not teaching at all or (2) primarily research-workers dabbling in clinical medicine, who regard research as in itself highly commendable, and teaching—which they usually do badly or not at all—as an unfortunate commitment, a damnable nuisance. You cannot bring up a family well if you regard children as a nuisance. Or are (3) those who talk a great deal about teaching, who even go through the prescribed motions of teaching, but who cannot teach.

I have personally questioned over 200 of my students who are graduates of British medical schools, and all but 8 have expressed the opinion that their clinical medical education was bad, often virtually non-existent. But they are afraid of expressing these views because of the throat-cutting competition and the scramble for posts which are virtually controlled by teaching-hospital consultants. Undergraduate clinical teaching is often a disgrace; often virtually non-existent; more often bad than mediocre and but very rarely good; frequently mischievously misleading; frequently depending on the whims of inexperienced house-physicians and registrars who cannot teach or know not what to teach. During this year I have privately coached over 50 graduates who are at present house-physicians or registrars at London teaching hospitals. This is in itself a sad commentary on the lack of teaching at their own schools that makes such private tuition necessary. But these graduates are often responsible for much of the clinical teaching at their own hospitals. Their clinical ignorance is often so appalling that I shudder to think what they are teaching the poor misguided undergraduates.

Now one of the main reasons for all this is that, with very few exceptions, the professors of clinical medicine are research-workers masquerading as clinicians. It is impossible to teach something that you do not know yourself. Moreover, these professors appoint as their assistants other research-workers, equally full of the learned ignorance of laboratories, equally incapable of teaching, equally with no enthusiasm for teaching. A professor of clinical medicine recently told a group of students that it was not his job to teach. Another professor of clinical medicine publicly stated that students should not be taught physical signs except in neurology, as they are all so much nonsense. (How sporting of him to admit the value of physical signs in neurology.) A London teaching hospital boasts that students are taught to find things out for themselves. This is a high-sounding excuse for not teaching. How can students find out for themselves how to elicit properly and interpret physical signs? Surely, they must be taught and shown these medical skills by people who really know how themselves. Most clinical professors do not give systematic lectures. One of them recently gave as his reason the excellence of modern textbooks, but when asked what excellent textbook he would advise to students beginning clinical work, he could not remember one. Students will voluntarily attend lectures if the lecturer can teach and has a stimulating and fresh approach. But the number of professors, readers, and full-time lecturers of clinical medicine who can lecture well and teach can be counted on the fingers of one hand and a badly mutilated hand at that. Not lecturing is usually an excuse to hide a complete inability to do so.

Those who demand the abolition of examinations do not appear to realise that what is usually at fault is not the examinations themselves but the examiners. We know that fools can ask questions which the wisest cannot answer. How many of the present examiners for the M.R.C.P. honestly consider themselves fitted for the task? Professor Bull draws graphs to prove that long answers are far less likely to be marked properly than short ones. What he ignores is the psychological make-up and the intellectual honesty of the examiners. The mere suggestion that examiners for a qualifying examination should be supplied with model answers itself casts grave doubts on the intellectual honesty of the examiners. The reason that even then papers would be marked differently is because some will expect the candidate to have written something near to the model answer, although they, the markers, know very little about the subject. Others, more honest, will be guided by their own knowledge of the subject compared with the model answer, and, with due humility, will mark accordingly. The same happens in clinical examinations. Often students are failed, especially in the higher examinations, by examiners who could not diagnose the cases themselves. Professor Bull and Professor Pickering want the abolition of the question which demands a long reply which can be learnt from any standard textbook. I agree with them. But who sets these bad questions if not the professors themselves? Do they blame this also on the Ministry of Health? Surely the truth is that to frame good questions requires a great deal of thought and trouble which the setters are rarely prepared to give them. That questions are so often of a bad type reflects not so much on the examination system as on the examiners.

Two points strike me regarding the multi-question papers. First, the guessing element which it engenders. I recently submitted such a final U.S.A. State medical paper to a barrister friend who has a little medical knowledge and he picked out 60% correct answers. But, secondly, to me the main point against such questions is that, in spite of the frequent delusions of some examiners to the contrary, there are often several reasonable answers, though some of them are better than others. Consider, for example, such a favourite viva question as "Why may congenital syphilitics complain of blurred vision?" (*a*) Optic atrophy, (*b*) choroiditis, (*c*) iritis, (*d*) interstitial keratitis, (*e*) retrobulbar neuritis—on which of these would Professor Bull pick?

The replacement of written papers by oral examinations is no solution because these also can be and often are reduced to a farce. I recall a detailed and true account given in *The Lancet* of March 31, 1951, of Dr. Girby's final surgical qualifying examination. In the "practical

3. Rundle, F. F. In Joll's Diseases of the Thyroid Gland. London, 1951.

viva" (sic) he was shown the starting-handle of a car and later a knife and fork, and questions about these constituted the whole of this part of the viva. In the clinical, the examiner's opening question was "Who was Sun Yat Sen?" and the rest of the viva revolved around this opening gambit. But I could fill very many pages of your journal with similarly fatuous true records of final vivas. What about the students who have been asked to identify mining drills, pieces of various mineral rocks, and capsules containing various drugs? What of the examiners whose sole repertoire is, "Who was—— and so and so and so and so?" These peculiar examiners ask these peculiar questions because they think these are matters of great importance which all doctors should know. These are the things which they themselves teach students.

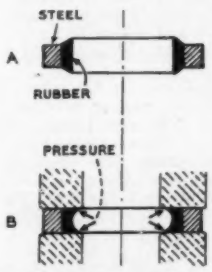
There has been much praise of the tutorial system at Oxford which boasts that each tutor looks after but one student at a time. But Oxford has a clinical intake per year of only 32 and, in your educational number several of the London teaching schools boast that they cater for Oxford and Cambridge clinical students. Teaching singly is a fine ideal, but where are Dr. Ellis and his friends going to find the type of tutor he describes in anywhere near sufficient numbers? Certainly, from my experience of them, there must be very few suitable among the London teaching hospital registrars at present. The number of physicians from the teaching hospitals who themselves would comply with Dr. Ellis's standards are very very few.

Lastly, why all this decrying of and sneering at factual knowledge? Surely you cannot be a good doctor without a good deal of factual knowledge. For example, how can you begin to understand clinical neurology without the factual knowledge of the manifestations of lesions of various parts of the nervous system? Can you be a competent doctor without the factual knowledge of the dosage and uses of commonly used drugs?

London, W.1. M. H. PAPPWORTH.

IMPROVED WASHER FOR USE WITH GAS CYLINDERS

SIR,—The fibre washers now in general use with reducing valves for oxygen, nitrous oxide, and other gases have long been a source of annoyance and uncertainty to persons continually using them. There is now available in the 'Dowty Seal' a washer which is efficient and easy to handle and which provides a gas-tight seal with finger-tight pressure.



Washer: A, free; B, in working position.

It consists of a cadmium-plated steel washer to the inside of which a synthetic rubber ring of special section is chemically bonded.

In the accompanying figure, A shows the seal in its "free" position, and B the seal in its "working" position. B shows also how increasing pressure tends further to enhance sealing efficiency by forcing the rubber lips tighter against the abutting surfaces.

Size AGS 1186 A fits the ordinary reducing valve and is proving satisfactory in anæsthetic practice. These seals are suitable for use with the non-interchangeable yokes about to be introduced.

I thank Messrs. Dowty Ltd., of Cheltenham, for taking an interest in this problem and for providing samples for experiment.

Cheltenham. J. SHEGOG RUDDELL.

THERMOMETERS FOR HYPOTHERMIA

Mr. H. M. Fisher, technical manager of Sierex Ltd., 241, Tottenham Court Road, London, W.1, writes:

Dr. Stride and Mr. Davis (Aug. 11) suggest that no instrument on the market fulfils the five criteria they list. The 'Electrothermometer' satisfies these criteria and is, we believe, superior to the device described by Dr. Stride and Mr. Davis.

The electrothermometer is a thermo-electric instrument which uses constantin/stainless-steel thermo elements which give extremely stable temperature readings and require little or no calibration after long use. Automatic temperature compensation is built into the unit, which enables its accuracy of ±0·1°C to be maintained even in rooms of differing ambient temperatures. The speed of response is far quicker than with the thermistor type of instrument. The measuring portion of the instrument comprises an extremely sensitive and robust mirror-galvanometer which gives a discrimination on a 6 in. scale of 0·05°C. A wide range of sterilisable applicators is supplied with the instrument, suitable for measurements of surface, intramuscular, and intracardiac temperatures and of the temperature of the rectum, œsophagus, &c. A special selector enables up to 15 temperatures to be selectively measured either on one patient or on a number of patients.

Medicine and the Law

The Witness in Jeopardy

A RECENT inquest[1] illustrates the position of the coroner in cases where claims may later come before the civil courts. The *Coroners' Rules, 1953*, clearly state that, when giving a verdict, care should be taken to avoid expressing an opinion on civil liability. This does not mean that evidence should be excluded solely because it tends to show the liability in tort of some person concerned. At the same time, the coroner must restrain questions tending to apportion blame rather than to establish the cause of death. This can put the coroner in an invidious position. He must make full inquiry and seem to be doing so; yet counsel, who appear in his court only by his leave, have, rightly, a keen eye on claims arising out of negligence.

A man died four days after a motor-cycle accident, from ruptured œsophagus and fractured skull. When he was first seen by a casualty officer, the skull fracture was not diagnosed and the man was sent home by ambulance, though he had walked into the casualty-room. Next day, X-ray examination failed to show the skull fracture, which was demonstrated post mortem. At the inquest, the following exchange took place after a question had been put to the casualty officer by the dependants' solicitor.

Solicitor: Do you agree that this man would not have died if a fractured skull had been diagnosed on the first day?

Coroner: I don't think he can answer that.

Solicitor: Surely as an expert witness he can.

Coroner: I am not going to have this Court turned into a High Court. If there is a claim in this matter this is not the place where it should be made. I am agreeable to a certain amount of latitude, but I don't think any doctor can answer that question.

Solicitor: It is his opinion I am asking for.

Casualty officer: I am not willing to express an opinion.

The relatives' representative was clearly trying to establish liability by an admission from the casualty officer. His question was reasonable from a tactical standpoint: but it did not help in the investigation of the cause of death. This is the kind of issue which must not be determined in a coroner's court and the coroner's refusal puts the principle concisely.

1. *Manchester Guardian*, Aug. 31, 1956.

The coroner's inquest is usually held soon after a fatality and is limited to finding how, where, and by what means the deceased died. One advantage is that facts are recorded while they are fresh and untinged by questions of prosecution or compensation. No person can refuse to give evidence, as the accused can in a preliminary hearing before magistrates. This means that a witness who could be held liable for a death might find himself in jeopardy. Such circumstances often arise after motoring accidents, or when employers have neglected safety precautions. Sometimes a medical practitioner may be involved over a matter of professional judgment.

Three situations may involve a witness in such difficulties at an inquest. When there has been criminal negligence—a special kind of wicked carelessness involving wanton and reckless disregard of the lives and safety of others—a coroner's jury may return a verdict of manslaughter and the person responsible is committed for trial on their inquisition. In such circumstances, he cannot refuse to give evidence, but he can object to questions tending to incriminate himself. When it seems that a less serious prosecution is likely—say, for dangerous driving—the witness can still object to incriminating questions, even though the question of committal on a coroner's inquisition does not arise. Finally, however, if the witness seems in danger only of an action for negligence in the civil courts, he cannot refuse to answer questions, even if they seem to indicate his liability. But the coroner has clearly in mind the limitation of the inquest to finding the cause of death and he will disallow lines of inquiry seeking to invade the territory of the High Court.

In the type of inquest which may precede a civil action, the coroner may find his experience and forensic ability strained to the utmost to exclude extraneous matter without seeming to suppress proper evidence. He will certainly allow some latitude to counsel, but he is also likely to show some forbearance to a person under criticism.

N.H.S. Prescriptions

A routine check of N.H.S. prescriptions issued by a doctor in Salford revealed that he had issued 115 prescriptions to 81 persons who could not be traced as being on his list at the time of issue. The Salford Executive Council sent the doctor a list of the persons concerned and invited him to submit written observations. The doctor replied that the names in the list appeared to fall into three main groups:

(i) Patients of other doctors who attended him for treatment while he was acting as deputy for their own doctors (holiday-scheme arrangements).
(ii) Patients whom he believed to be on his own list, but who had apparently failed to comply with the proper formalities for inclusion on his list.
(iii) Private patients to whom he had issued N.H.S. prescriptions "for reasons of expediency and out of consideration for the patient."

The executive council, with the consent of the doctor, thereupon referred the matter to the medical service committee. After hearing the doctor, the committee came to the following conclusions:

(1) They accepted his contention that, with 4 exceptions, the patients in group (i) were patients of holiday-scheme doctors for whom he was acting as deputy. But he had failed to sign any of these prescriptions "per pro" the doctor for whom he was acting, and this was a breach of clause 8(7) of the Terms of Service.

(2) They accepted the doctor's statement that he was under the impression that the patients in group (ii) were on his list. But, on his own admission at the hearing, he had neglected to keep medical record cards in breach of clause 13(a) of the Terms of Service. Reference to his medical record cards would have shown that none of the persons in this group was on his list, and by issuing N.H.S. prescriptions to them he had committed a breach of clause 7(10).

(3) All the persons in group (iii) were private patients, and consequently the doctor was in breach of clause 7(10) in issuing N.H.S. prescriptions to them.

The committee took a very serious view of the way in which the doctor had conducted his practice since his inclusion in the Salford medical list. They recommended that the Minister be asked to inflict a very substantial monetary penalty and to warn him that any similar breaches in future would lead to proceedings for his removal from the medical list. The Salford Executive Council adopted this recommendation, which has been forwarded to the Minister.

Obituary

EDWARD BALD JAMIESON
M.D. Edin.

Dr. Jamieson was born in Shetland 80 years ago, and to the end of his days he retained a hint of an accent which betrayed his Northern origin. His massive figure in white coat and black velvet skull-cap, and his genial smile, will be clear in the memories of many generations of students who passed through the anatomy department of Edinburgh University. He had perhaps a greater personal influence on them than anyone of his time, and many owe much to his kindly advice.

He came of an able and successful family. His eldest brother, Francis, was for many years chief inspector of schools for Scotland and a distinguished classical scholar. Another brother, J. Kay Jamieson, was professor of anatomy at Leeds and later at Trinity College, Dublin, while his younger brother, Dr. J. P. S. Jamieson, C.B.E., now of Nelson, New Zealand, was lately awarded the gold medal of the British Medical Association. All the brothers began their education at their father's school at Sandness, and Jamieson himself graduated M.B. in the University of Edinburgh in 1900. He was at once appointed to the staff of the anatomy department under Sir William Turner. There he worked with D. J. Cunningham, Arthur Robinson, J. C. Brash, Auckland Geddes, and many other distinguished anatomists. As a teacher of anatomy he was unsurpassed. He appeared to be free from personal ambition and to find complete satisfaction in handling medical students. He did little research; but in his early days, before he became engrossed in the preparation of his well-known anatomical textbooks and atlases, he carried out a series of beautiful dissections of the formalin-hardened brain, and submitted them, with his descriptions and comments, as a thesis for the M.D. degree, for which he was awarded a gold medal in 1906. Later, in the *Journal of Anatomy and Physiology*, he published further communications on the same topic. He was appointed senior lecturer in the department in 1909, and he held this post till he retired in 1945.

Jamieson spent his summer vacations at his home in Shetland. For many years he lived during term-time in St. Giles House and later in Ramsay Lodge, the student hostels of the Town and Gown Association. When he retired in 1945, to encourage the continued study of regional anatomy, he gave the university a substantial fund for prizes in that subject for final-year students. By his will royalties from his books will be added to the fund. He died on Aug. 16.

W. Q. W. writes:

By his clear and deliberate diction and his wonderful series of drawings Jamieson led his students step by step through the parts of the human body in such a way that none but the most dull could fail to acquire a reasonable understanding of his subject. Apart from his teaching he kept an eagle eye on the career of each student in his hands. He was aware of the capabilities and performance of each, and the slacker would soon be invited to his private room for a little talk which seldom failed to be beneficial. In his teaching and in the handling of students he was greatly helped by his prodigious memory, which in time became almost legendary. Meeting a former student in the street after 20 or 30 years he would smile on him and then name him as "Smith"—

"J. E."—"dissected with so-and-so in 1925," and he rarely made a mistake.

He usually invited a few privileged students to his Northern home during the summer holidays. There they were taken to a croft in the "wilderness" and were made to work very hard—some much harder than they had ever worked before—sea-fishing, sailing, helping on the croft, or, it might be, building a pier. They returned to civilisation sometimes chastened but very much the better of their experience. He had a great love of music and accumulated a large collection of the best gramophone records, with which he entertained his friends. He was fond of golf and played a steady determined game.

His students looked on "Jimmie" with great respect—there was never any disturbance in his classes—but also with real personal affection, as the following lines show.

But Jimmy, darling Jamieson, to whom all students pray,
Forgive me if my words seem rude, for kindly meant are they;
And though we know you've got us "taped," and see us through and through,
Yet every single one of us is very fond of you.

T. B. J. was associated with Jamieson in the 1933 revision of the Basle nomenclature of anatomy. "Most of the work had to be done by correspondence and what a correspondent Jamieson proved to be."

His letters (T. B. J. continues) varied from a few lines, always terse, clear and to the point, to some ten pages or more. After our final report was accepted our habit of corresponding continued, even though references to anatomy gradually diminished and finally disappeared, and we kept up a spasmodic but unbroken series of letters for more than forty years.

The regard in which his students held him was a curious mixture of awe, respect, and admiration and these resolved into a strong personal affection on better acquaintance. He was the confidant of every student in trouble or in difficulties for they could rely upon him to give them a fair hearing and the best of advice. His name cropped up so often in letters home that parents living at a distance felt they knew him well before ever they had seen him. E. B. J. was a man of strong character, great courage, consistently sincere, and therefore always outspoken. He had little respect for pure academic distinction, ever stressing the need for precise and accurate knowledge and clarity of description. He was one of the last of the older school of anatomists.

Public Health

Poliomyelitis

IN the week ended Aug. 25 uncorrected notifications of poliomyelitis in England and Wales were as follows: paralytic 63 (58), non-paralytic 114 (97); total 177 (155). This is an increase of 22 compared with the previous week, the figures for which are in parentheses. Notifications remain below the average for the time of year.

Infectious Diseases in England and Wales

Disease	Week ended August			
	4	11	18	25*
Diphtheria	..	4	5	1
Dysentery	603	445	430	379
Encephalitis:				
Infective	3	3	6	4
Postinfectious	6	1	2	4
Food-poisoning	334	233	298	247
Measles, excluding rubella	3220	2685	2400	1866
Meningococcal infection	26	18	9	28
Ophthalmia neonatorum	30	24	18	29
Paratyphoid fever	8	12	5	11
Pneumonia, primary or influenzal	197	136	197	180
Poliomyelitis:				
Paralytic	73	58	58	63
Non-paralytic	58	76	97	114
Puerperal pyrexia	220	166	235	222
Scarlet fever	426	276	285	245
Smallpox	..	..	..	..
Tuberculosis:				
Respiratory	626	486	597	530
Meninges and C.N.S.	8	7	7	9
Other	79	66	79	63
Typhoid fever	1	5	5	8
Whooping-cough	2146	2135	2504	2515

* Not including late returns.

Notes and News

HOSPITAL DIETS

THE prescription of a special diet for a patient is easy enough in a large hospital with a diet department staffed by trained dietitians. But in most hospitals, where there is insufficient work for a full-time dietitian and sometimes no part-time dietitian, it is often worrying for medical and nursing staffs to provide a proper therapeutic diet in accordance with the best modern practice. King Edward's Hospital Fund has made a most valuable contribution by providing a succinct and instructive booklet, now published in a second edition,[1] which should be especially welcomed by ward sisters, on whom the responsibility of feeding the patient has always rested: "The catering officer should provide attractive food from his kitchen in accordance with sister's orders, which in turn are derived from the doctor." The young medical graduate should find it a useful lexicon for translating theory into the practice of providing meals for patients under his care.

The Fund's handbook on general hospital diets, which also has appeared in a second edition,[2] gives sample menus for a specimen week in every month of the year, allowing for the foods available at each season. It states the probable cost of each dish, at the prices obtaining in 1955. Catering-officers, kitchen superintendents, and housekeeping sisters will find it a valuable vademecum. Hospital authorities also would do well to consider its implications, especially in relation to costs. It is not always realised what large adjustments in hospital budgets are necessary to meet the rising cost of food, if nutritional standards are to be maintained. The cheapest satisfactory menu in this handbook cost 23*s.* $7^1/_4$*d.* per head per week in 1955; and if patients are to be allowed such indulgences as frozen foods, soup twice a day, three-course dinners, and fresh coffee, the cost was 29*s.* $5^1/_2$*d.*

INTERNATIONAL ABSTRACTS OF BIOLOGICAL SCIENCES

THE council of Biological and Medical Abstracts Ltd. is changing the title of *British Abstracts of Medical Sciences* to *International Abstracts of Biological Sciences*. With the coöperation of specialist editors selected by the institute of scientific information of the Academy of Sciences of the U.S.S.R., the journal will include, from next January, translations of the important Russian papers abstracted in the *Referativny Zhurnal Biologii* (Soviet Biological Abstracts) and *Referativny Zhurnal Biologischekoi Khimii* (Soviet Abstracts of Biological Chemistry), which will appear simultaneously with the Russian abstracts. It is published on a non-profit-making basis, and the council has representatives of the Association for the Study of Animal Behaviour, the Biochemical Society, the Association of Clinical Pathologists, the International Association for Dental Research, the Society for Endocrinology, the Society for Experimental Biology, the Nutrition Society, the Pharmacological Society, and the Physiological Society. Since the Russian abstracts will have to be translated, the council requires translators with knowledge of anatomy, animal behaviour, biochemistry, endocrinology, experimental biology, experimental medicine, microbiology, odontology, pathology, pharmacology, and physiology. The honorary editor is Dr. C. C. N. Vass, c/o Pergamon Press Ltd., 4, Fitzroy Square, London, W.1, or 122, East 55th Street, New York, 22, N.Y.

TWO MEDICAL ANECDOTES OF WILLIAM HARVEY

THE forthcoming tercentenary of the death of William Harvey lends added interest to two of his case-notes recorded by Dr. R. A. Hunter and Dr. Ida Macalpine.[3] These illustrate the interest in and understanding of "the signal influence of the affections of the mind" that have always characterised a great clinician.

These anecdotes of Harvey's clinical practice recorded by Sir Kenelm Digby and Robert Boyle, supported by further evidence from his published writings, show that Harvey applied his genius also to those branches of medicine which have since developed separately as neurology and psychiatry. The first case was that of an exceedingly strong male servant

1. Memorandum on Special Diets. Hospital Catering Advisory Service, King Edward's Hospital Fund for London. 2nd ed. 1956. Pp. 43. 2*s.* (post free). Obtainable from the King's Fund, 10, Old Jewry, London, E.C.2.
2. General Hospital Diets. 2nd ed. 1956. Pp. 131. 5*s.* (post free).
3. Hunter, R. A., Macalpine, I. *St. Barts Hosp. J.* 1956, **60**, 200.

of the College of Physicians who was so devoid of feeling that he used to grind his hands against walls and coarse lumber so that they would run blood through the grating of the skin without apparent pain or other sensation. The second was that of an 18-year-old maid who had so lost the sense of feeling that it was possible to pin a handkerchief to her bare neck without her being aware of it. Harvey advised that she should be provided with a husband by whom "to many men's wonder" she was cured of her strange disease.

NEEDS OF THE OLD

IN a pamphlet entitled *Caring for the Elderly*,[1] to which the late Cardinal Archbishop of Westminster contributed a foreword, Dr. Thomas Rudd outlines the history of infirmaries in Western society. Before the Reformation there were in England alone 800 infirmaries in which the sick, the aged, and the destitute could find refuge and receive nourishment, simple treatment, and spiritual consolation. From these stemmed the almshouses which likewise provided for material and spiritual needs.

Ideally people should be able to live out their lives in their own homes, though where home care presents insuperable difficulties residential care must replace it, at any rate for a time. To a varying extent in different places, the elderly at home may get the benefit of medical, nursing, domestic, and night attendants' services, nursing appliances, and social amenities. But, if they are to have a chance of happiness, more than material needs have to be met: there must be a purpose in life, some security of tenure, and some freedom of choice.

As a devout Roman Catholic, Dr. Rudd sets great store by a religious background for old age and deplores that a social survey of 100 over-70s, living either alone or with other old people, revealed that only 7 had regular or occasional visitors from their church. Many, he concludes, would enter old age better equipped for its hazards if some little spiritual preparation for retirement were made instead of a wholly economic one. The care of old people in the modern world he regards as a challenge not only to governments but also to the Christian Church.

FLIES IN HOT CLIMATES

THE greater difficulty of controlling flies in hot countries is illustrated by observations in Israel by Dr. H. Speich, medical consultant of the World Health Organisation.[2] During a recent visit he found that, in the Israeli climate, there are about 26 generations of flies per year compared with about 11–13 in Central and Northern Europe. In the summer heat the pupal stage of flies in Israel lasts only three days, compared with ten to twelve days in cooler weather.

One experiment showed how numerous flies can be in Israel. In a large kitchen, 180 metres from the nearest important breeding-place (a cowshed), a net was cast 10 times per hour over a work-table. The number of flies trapped in three hours was 3400. Since each throw of the net was eluded by about a third of the flies on the table, it is estimated that 1800 fresh flies arrived every hour.

FOOD ADDITIVES

A REPORT from the World Health Organisation[3] outlines the advantages of international action on food additives, pointing out that the potential health hazards from inadequate control of their use are world-wide, that exchange of information and experience would be useful, and that the size of the problem makes it impossible for any single country to undertake the investigations needed. The food additives singled out as deserving priority are food colours, preservatives (anti-microbial agents and antioxidants), and emulsifiers, in that order.

South African College

Dr. G. A. Elliott, professor of medicine in the University of the Witwatersrand, has been elected president of the newly formed College of Physicians and Surgeons of South Africa.

1. London: Catholic Truth Society, 28A, Ashley Place, S.W.1. 1956. Pp. 20. 4*d*.
2. World Health Organisation. *Health Front*, July–August, 1956, p. 1.
3. Joint F.A.O./W.H.O. Conference on Food Additives. *World Hlth Org. tech. Rep. Ser.* no. 107. 1956. Pp. 14. Available from H.M. Stationery Office. 1*s*. 9*d*.

Royal Society of Medicine

Section of Anæsthetics.—The first award of the registrars' prize has been made by the council of this section to Dr. Sheila Wilson (Westminster Medical School) for her paper on electro-encephalography in relation to anæsthesia. Dr. D. J. Pearce (Westminster Medical School) was named proxime accessit for his paper on the rôle of posture in laminectomy.

Association of Clinical Biochemists

On Saturday, Oct. 6, at 9.30 A.M., at the Royal College of Surgeons, Lincoln's Inn Fields, London, W.C.2, this association will hold a joint meeting with the Association of Clinical Pathologists. A lecture will be given by Sir Rudolph Peters, F.R.S., and a symposium will be held on biochemical lesions, including keto-acid metabolism and the citric-acid cycle.

W.H.O. Office in Brazzaville

The World Health Organisation's regional office for Africa has now been established at the Cité du D'joué, some 12 km. from Brazzaville, French Equatorial Africa. By the generosity of the French government, a two-storey building, with space for 40 offices, has been constructed on a hill overlooking the Congo rapids. Some of the offices have been put at the disposal of the United Nations Children Fund. The W.H.O. regional office has been centred at Brazzaville since 1952 under the direction of Dr. Cambournac. Dr. V. Sutter, assistant director-general of W.H.O., at the opening ceremony, said that this was the first time that a government had constructed a special administrative building and put it at the disposal of W.H.O.

Deaf Children's Society

This society is holding a conference in London on Oct. 25 and 26 to which organisations which are working on behalf of deaf children in different parts of the country are sending delegates. At 7 P.M. on the 25th a public meeting will be held at the Kingsway Hall at which Mr. Michael Reed and Mr. Pierre Gorman will speak on the psychological problems of deaf children. The society's address is 1, Macklin Street, London, W.C.2.

Births, Marriages, and Deaths

BIRTHS

REES.—On Aug. 27, at Abercothi House, Nantgaredig, Carmarthen, to Mair, wife of R. L. Rees, F.R.C.S.—a daughter.

Appointments

BROWNE, D. W., M.R.C.S., D.T.M.&H., D.P.H.: M.O.H., city of Chichester and Bognor Regis U.D., and school M.O., West Sussex County Council.
DAWSON, A. M., M.R.C.S., M.R.C.O.G.: whole-time S.H.M.O., Lewis Hospital, Stornoway.
ORME, J. D., M.R.C.S., D.P.M.: consultant children's psychiatrist, Barnsley, Rotherham area.
SHAW, C. H., M.D. Lond., D.P.H., D.P.A.: deputy M.O.H., public-health department, Sheffield.
WALKER, A. H., PH.D., M.B. Lond.: asst. county M.O.H. and school M.O., Gloucestershire County Council.

Colonial Appointments:

BAHEMIA, C. M., L.R.C.P.I.: M.O., health department, Mauritius.
BROWN, F. P., M.B. Lond., D.OBST.: M.O., Kenya.
BUTLER, G. C., M.B. N.U.I., D.P.H.: senior M.O. (administrative), northern region, Nigeria.
CURRIE, R. H., M.B. Belf., D.P.H.: M.O., special grade, Tanganyika.
EVANS, A. J., M.B. Lond., D.A.: specialist (dermatologist and venereal diseases), western region, Nigeria.
HADLOW, W. P., M.B. Lond.: M.O., Somaliland Protectorate.
JONES, C. R., M.B.E., M.B. Wales: asst. health adviser, Eastern Aden Protectorate.
KAY, J. A., B.M. Oxfd: M.O. (S.P.H.S.), Fiji.
KOUPPAS, A. K., M.B. Athens, D.M.R.D.: specialist (radiologist), Cyprus.
LLEWELLYN-JONES, J. D., M.B. Dubl., M.R.C.O.G.: specialist obstetrician, Federation of Malaya.
LOW, A. H., M.B. Lond., D.C.H.: lady M.O., Uganda.
MACPHERSON, J. J., F.R.C.S.E.: specialist surgeon, grade B, Federation of Malaya.
MARRABLE, H. J., M.B. Leeds: M.O. (S.P.H.S.), Fiji.
O'BEIRN, NICHOLAS, M.B. N.U.I.: M.O. (tuberculosis), western region, Nigeria.
PARNIS, R. O., M.D. Malta, F.R.C.S.: specialist surgeon, western region, Nigeria.
PULESTON-JONES, W., M.R.C.S., D.P.H., D.T.M.&H.: administrative M.O., grade A supernumerary, Federation of Malaya.
RAY, K. D., M.B. Calcutta, F.R.C.S.: M.O., special grade, northern region, Nigeria.
TALLACK, R. J. K., M.B. Brist., D.P.H.: senior M.O., Kenya.
WILSON, T., M.D. Belf., D.P.H., D.T.M., D.T.H.: director of the Institute for Medical Research, Federation of Malaya.

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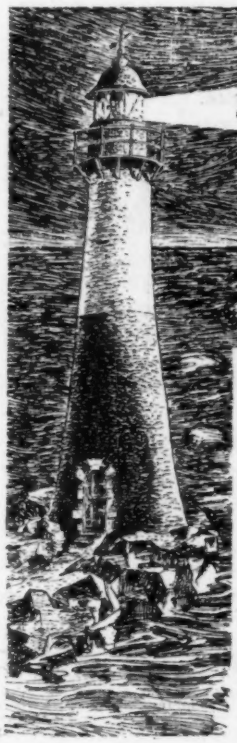

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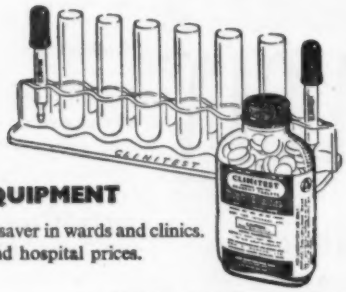

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REFERENCES

(1954) 'Clinical Tests for Ketonuria', '*Lancet*', *April 17th, pp. 801/804*
(1954) '*Medicine Illustrated*', *May, p. 289*
(1954) '*Practical Clinical Biochemistry*', *Heinemann, p. 74*
(1954) 'Clinical Tests for Ketonuria', '*Lancet*', *July 10th, p. 95*

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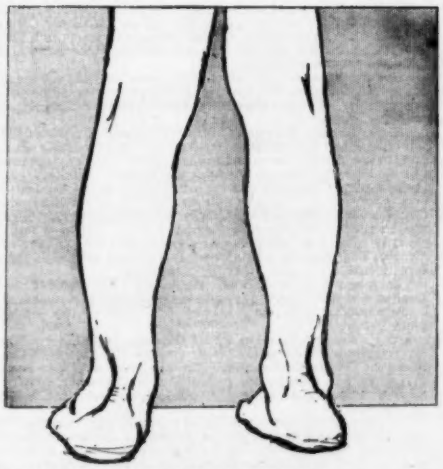

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Notable addition to range of Biochemical Products

The year's trading throughout the Group has been active, and the satisfactory results reflect the contributions of all the various divisions, the profit being £1,503,208 higher than last year. After deducting interest on loans, the profit from all sources is £20,311,430, out of which £10,484,301 has to be provided for taxation. The increased profit has been derived principally from the Company's Scotch Whisky and Gin interests. Notwithstanding the serious difficulties which beset industry in general today, and the need to retain a portion of profits to maintain real working capital despite the depreciating currency, the Directors recommend that a moderate increase should be made in the dividend paid to the Company's Ordinary shareholders, who now number about 100,000, making a dividend for the year equivalent to 17½%, compared with 16½% last year.

Scotch Whisky and Gin

In the past year, in spite of difficulties due to the abnormally low rainfall, production of Scotch whisky has been reasonably satisfactory and the Company has fully maintained its position in the industry. Scotch whisky remains one of the greatest dollar earners of the United Kingdom. Extensive reconstruction continues to be carried out at a number of distilleries, with the object of bringing them to the highest state of efficiency. Substantial sums have also had to be provided to cover the cost of new bonded warehouses to accommodate increasing stocks. At the same time the Company is engaged in an extensive programme for the construction of new houses and the modernisation of existing ones at distilleries throughout Scotland.

The improving inventory has, however, enabled sales to be expanded, and in this achievement the Company has fully maintained its position in the industry. In spite of the duty on Scotch Whisky, which is now almost treble the pre-war figure and today stands at the staggering figure of £10 10s. 10d. per proof gallon, the increase by the trade as a whole of some 12% over the preceding year is not only a tribute to the quality and acceptance of Scotch Whisky as an international beverage, but carries with it encouraging promise for the future.

As regards Gin, the Companies are making excellent progress and enjoying increased home and export sales. This section of the organisation plays a valuable part in the country's over-all economy.

Yeast

Although the continued fall in the consumption of bread inevitably entails a reduction in the demand for Yeast, an increase in the sale of Bakers' Sundries has been achieved. Certain reorganisation measures are beginning to bear fruit, and total earnings have improved.

INDUSTRIAL GROUP

The Industrial Group has made satisfactory progress during the past year in face of strong competition and despite the higher cost of raw materials and labour. Improved processes and efficiencies have absorbed the major part of these increases and prices have remained stable. Whilst inevitably there has been some contraction in margins, the over-all profit earned corresponds closely to that of last year.

Chemical Division

Sales of solvents and other synthetic chemicals and intermediates are satisfactory. The vinyl acetate plant of the Associated Company, Headon Chemicals Limited, should be ready to start up in October next. The demand for this material continues to expand and the sales prospects are good.

Sales of carbon dioxide, which, apart from its wide use for refrigeration, is rapidly gaining importance in its industrial applications in the engineering field, showed a further substantial increase in tonnage.

During the year, the name of British Petroleum Chemicals Limited was changed to British Hydrocarbon Chemicals Limited. This was done to avoid confusion with the name of the Company's partners in this undertaking, British Petroleum Company Limited. British Hydrocarbon Chemicals and its subsidiary, Forth Chemicals Limited, operated at Grangemouth to full capacity throughout the period, and earnings were satisfactory. The plant is being doubled and should be completed by the end of 1956. The new butadiene plant is nearing completion and should come into operation this month. The material is of growing importance as one of the main constituents of a variety of synthetic rubbers.

The monomeric styrene plant extension for Forth Chemicals Limited was scheduled for completion in April last, but was delayed by an unofficial strike. It is now hoped to start up this unit almost immediately.

The detergent alkylate plant of the other subsidiary of British Hydrocarbon Chemicals Limited, Grange Chemicals Limited, in which the Oronite Company of California holds a third interest, was completed and commenced production in December, 1955. This plant is producing a high quality product, and sales are developing satisfactorily.

The demand for industrial alcohol shows a steady increase. When the Grangemouth extensions are completed, British Hydrocarbon Chemicals will be producing synthetically two-thirds of the Company's output of industrial alcohol, the balance being produced by the fermentation of molasses.

BIOCHEMICALS DIVISION

The competitive conditions in the sale of antibiotics in general, and of penicillin and streptomycin in particular, have been keener than ever, and although it has been possible to increase the volume of sales, profit margins on a considerable part of the export business have been meagre. However, during the last few months, there have been signs that the prices of antibiotics are hardening, and the future may show that there have been adjustments of the excess production which led to these uneconomic selling conditions and prices will reach a more stable and satisfactory level.

The medical and pharmaceutical professions will be glad to know that during this year the Company was able to make a notable addition to its range of products. This is phenoxymethyl penicillin which, for the first time, makes penicillin available in a safe and effective form for administration by mouth instead of by injection. "Distaquaine" V is really a new substance. Unlike the earlier penicillin G, it is stable under the acid conditions which normally occur in the human stomach. It is this completely novel characteristic which makes it effective in oral administration and constitutes such a great advance in antibiotic therapy. Marked progress has already been made in the sale of this product. The Company is the sole manufacturer in the United Kingdom, and has also secured exclusive rights in certain overseas markets.

When the Company first entered the biochemical field, it marketed its products through a number of well-known British pharmaceutical houses. This system of distribution was excellent when the products were in short supply, but, now that antibiotics are freely available and the Company has extended its range of products, it has decided, by arrangements with the Companies concerned, to build up its own sales organisation on a world-wide basis. The reorganisation is already well in hand and whilst acknowledging the valuable service the Company's distributors have given in the past, it is anticipated that more direct sales promotion will have beneficial results.

Plastics Division

The continually expanding demand for plastics materials resulted in substantially increased turnover. Sales of the Company's synthetic resins and moulding powders continued to progress in many varying fields. The latest extension to the plant of British Geon Limited was completed and brought into operation in January of this year and its product, polyvinyl chloride, is selling well. The new plant of Distrene Limited was completed and operating by December, 1955. Despite keen competition its products, marketed under the trade name "Styron," are in good demand both at home and abroad.

Murgatroyd's Salt and Chemical Company Limited, owned jointly with Fisons Limited, has completed the new 15,000 tons per annum extension to its chlorine and caustic soda plant. This additional installation represents the very latest practice and is the first of its kind in the United Kingdom.

Magnesium Elektron Limited, in which the Company is now associated with the British Aluminium Company Limited, has had a good year of expanding sales. Of particular interest is the use of magnesium for cathodic protection of metals against corrosion, particularly iron and steel, which is now standard practice with many of the largest shipping companies, particularly for tankers.

SOUTH AFRICA.—For the Associated Company, National Chemical Products Limited, this has been a year of considerable progress, with earnings substantially higher than last year.

AUSTRALIA.—The Associated Company, C.S.R. Chemicals Pty. Limited, has had a more satisfactory year. It is gratifying that the application to the Tariff Commission for some form of assistance in the development of this new enterprise has been successful, and the Australian Government has granted a bounty on production of cellulose acetate flake retrospective to July, 1955.

TECHNICAL DEVELOPMENT

Much is written today about what is called "Automation" which suggests to some that this is a new development in industry. It is, in fact, the progressive improvement of methods of manufacture and of control which has always been an essential part of industrial progress both here and in other countries. The competitive conditions prevailing in world trade today largely dictate the speed of such progress.

In this essential field, the Company's Research and Engineering Departments play an important part, continually improving the performance of the various plants by the extended use of mechanisation and instrumentation, the introduction of the latest types of automatic control, and the development of new and improved processes.

Personnel Recruitment and Training

The continuing industrialisation of the country makes overwhelming demands upon our universities, technical colleges and schools. The Company is giving every consideration to staff recruitment and training methods. With this in mind, the Company is happy to be associated as a founder member with the Industrial Fund for the Advancement of Scientific Education in schools (which receive no Government finance) and thus to encourage a large number of young people to study science from an early age.

Today over 20,000 men and women are employed by the Group, and good staff relationship is abundantly reflected in the large number who qualify under the scheme for long-service awards after 25 and 40 years' service.

Future Prospects

The current year's trading results are so far encouraging. Although effects of the 'Credit Squeeze' are likely to be felt in the home market, the Company's operations are so broadly based, both in the United Kingdom and overseas, that satisfactory results for the current year can be anticipated with reasonable confidence.

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WANTAGE HOUSE

This is a Reception Hospital in detached grounds with a separate entrance, to which patients can be admitted. It is equipped with all the apparatus for the complete investigation and treatment of Mental and Nervous Disorders by the most modern methods; insulin treatment is available for suitable cases. It contains special departments for hydrotherapy by various methods, including Turkish and Russian baths, the prolonged immersion bath, Vichy Douche, Scotch Douche, Electrical baths, Plombières treatment, etc. There is an Operating Theatre, a Dental Surgery, an X-ray Room, an Ultraviolet Apparatus, and a Department for Diathermy and High-frequency treatment. It also contains Laboratories for biochemical, bacteriological, and pathological research. Psychotherapeutic treatment is employed when indicated.

MOULTON PARK

Two miles from the Main Hospital there are several branch establishments and villas situated in a park and farm of 650 acres. Milk, meat, fruit, and vegetables are supplied to the Hospital from the farm, gardens, and orchards of Moulton Park. Occupational therapy is a feature of this branch, and patients are given every facility for occupying themselves in farming, gardening, and fruit growing.

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The seaside house of St. Andrew's Hospital is beautifully situated in a park of 330 acres, at Llanfairfechan, amidst the finest scenery in North Wales. On the North-West side of the Estate a mile of sea coast forms the boundary. Patients may visit this branch for a short seaside change or for longer periods. The Hospital has its own private bathing house on the seashore. There is trout-fishing in the park.

At all the branches of the Hospital there are cricket grounds, football and hockey grounds, lawn tennis courts (grass and hard courts), croquet grounds, golf courses, and bowling greens. Ladies and gentlemen have their own gardens, and facilities are provided for handicrafts, such as carpentry, etc.

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Academic and Educational

THE UNIVERSITY OF MANCHESTER
DEPARTMENT OF THE EDUCATION OF THE DEAF

COURSE FOR MEDICAL OFFICERS OF HEALTH

A course arranged by the Department of the Education of the Deaf, for a limited number of Medical Officers engaged in the Public Health Service, will be held in the University from 12TH TO 15TH FEBRUARY, 1957, inclusive. The course of instruction will include the principles and practice of screening and diagnostic tests of hearing and home-guidance to the parents of deaf children of pre-school and school age. Fee for the course will be 4 guineas.

Applications should be made to the Department of Education of the Deaf, The University, Manchester, 13.

COURSE IN ORTHOPÆDIC SURGERY
HARLOW WOOD ORTHOPÆDIC HOSPITAL, near MANSFIELD, NOTTS

29TH OCTOBER–2ND NOVEMBER, 1956

29th Oct.	Introduction	Mr. S. A. S. MALKIN
	The Rehabilitation of the Orthopædic Patient	Mr. S. A. S. MALKIN with Mr. J. D. MALLOCH
	Hand Surgery	Mr. R. G. PULVERTAFT
30th Oct.	The Replacement of Skin in Trauma	Mr. D. WYNN-WILLIAMS
	Some Aspects of Spinal Surgery in connection with the Relief of Pain	Mr. A. N. BIRKETT
	Hand Surgery	Mr. R. G. PULVERTAFT with Mr. D. A. REID
31st Oct.	The Management of Rheumatoid Arthritis by the Physician	Dr. J. M. MACFIE
	The Management of Rheumatoid Arthritis by the Surgeon	Mr. L. MORRIS
	Osteoarthritis of the Hip	Mr. J. P. CAMPBELL with Mr. D. H. MCMILLAN
1st Nov.	Anæsthetics in Orthopædics	Dr. A. G. HEGARTY
	The Acute Stage of Poliomyelitis	Dr. J. C. H. MACKENZIE
	Patterns of Paralysis and Deformity in Poliomyelitis	Mr. W. J. W. SHARRARD
	The Treatment of Tuberculosis of the Hip	Mr. J. P. JACKSON
2nd Nov.	Delayed Union and Non-union of Bone	Mr. S. M. THOMPSON
	The Treatment of Paraplegia	Mr. F. W. HOLDSWORTH
	Injuries of the Cervical Spine	Mr. ROLAND BARNES
	The Diagnosis and Prognosis in Malignant Bone Tumours	Sir HARRY PLATT

No fee for the course.

Applications to be sent to Secretary, Harlow Wood Orthopædic Hospital. Limited accommodation available, if required, at associated hospital.

PADDINGTON GROUP HOSPITAL MANAGEMENT COMMITTEE
THE TAVISTOCK CLINIC

INTRODUCTORY COURSE ON PSYCHOLOGICAL PROBLEMS IN GENERAL PRACTICE

A course of 8–10 weekly discussion meetings for a limited number of general practitioners will start in the AUTUMN. Day and time of meeting to be arranged to suit participants. Admission is free.

Apply in writing for further particulars to Medical Director, Tavistock Clinic, 2, Beaumont-street, W.1, stating possible times for attending.

THE ROYAL INSTITUTE OF PUBLIC HEALTH AND HYGIENE

THE DIPLOMA IN PUBLIC HEALTH
THE DIPLOMA IN INDUSTRIAL HEALTH

The next COURSES OF INSTRUCTION for the above Diplomas will commence on 28TH SEPTEMBER, 1956. Tuition may be taken whole-time or part-time.

Prospectuses, enrolment forms and full details may be obtained from the Secretary, 28, Portland-place, London, W.1 (Telephone : LANgham 2731/2).

DENTAL AND MEDICAL SOCIETY FOR THE STUDY OF HYPNOSIS

The above society will hold a STUDY GROUP ON THE THEORY AND PRACTICE OF HYPNOSIS beginning on WEDNESDAY, 3RD OCTOBER, 1956. 2-hour lecture-demonstrations will begin at 7.15 P.M.

An INTENSIVE WEEKEND COURSE will be held on 24TH and 25TH NOVEMBER for members who live too far away from London to attend the full course.

A fee is charged for these Study Groups.

The Society is prepared to send a team of lecturers and subjects to any locality in Great Britain to give an intensive weekend course provided that sufficient Medical and Dental practitioners are willing to attend.

Further details may be obtained from the Secretary, Mr. DAWSON WATTS, 22, Gordon-road, Ealing, W.5.

UNIVERSITY OF OTAGO
DUNEDIN, NEW ZEALAND

RALPH BARNETT CHAIR OF SURGERY

The University of Otago proposes to appoint a Full-time PROFESSOR OF SURGERY. Salary £3000 p.a.

Further particulars may be obtained from the Secretary, Association of Universities of the British Commonwealth, 36, Gordon-square, London, W.C.1.

Applications close on 31st October, 1956, in London and New Zealand.

L.M.S.S.A.

FINAL EXAMINATION : SURGERY, 8th October, 12th November, 3rd December, 1956. MEDICINE, PATHOLOGY, 15th October, 19th November, 10th December, 1956. MIDWIFERY, 16th October, 20th November, 11th December, 1956. MASTERY OF MIDWIFERY, May and November. DIPLOMA IN INDUSTRIAL HEALTH, July and December.

For regulations apply REGISTRAR, Apothecaries Hall, Black Friars-lane, London, E.C.4.

ST. MARY'S HOSPITAL MEDICAL SCHOOL (University OF LONDON), Paddington, W.2. Applications are invited from registered medical practitioners for the post of RESEARCH ASSISTANT to study the Respiratory Physiology of the New Born. Preference will be given to science graduates. Salary £1000 p.a.

Applications, with names of 2 referees, to the Secretary, St. Mary's Hospital Medical School, by 1st October, 1956.

THE UNIVERSITY OF MANCHESTER. Applications are invited for the post of SURGICAL TUTOR. Salary £900 p.a., with membership of children's allowance scheme. The Tutor will be required to give instruction in practical surgery and supervise the studies of students during their period of clinical apprenticeship. In addition the Tutor will be required to take part in the clinical and research activities of the Department of Surgery. A higher qualification in surgery will be considered an advantage.

Applications should be sent not later than 24th September to the Registrar, The University, Manchester, 13, from whom further particulars and forms of application may be obtained.

UNIVERSITY OF GLASGOW. Applications are invited for a LECTURESHIP IN BACTERIOLOGY. Salary according to placement on University scale for clinical teachers. The final maximum is £1750 p.a. F.S.S.U. and family allowance benefits.

Applications (12 copies) should be lodged, not later than 28th September, 1956, with the undersigned from whom further particulars may be obtained.

ROBT. T. HUTCHESON, Secretary of University Court.

UNIVERSITY OF GLASGOW. Applications are invited for a LECTURESHIP in the Department of Medicine at the Western Infirmary. Salary according to placement on University scale for clinical teachers. The final maximum is £1750 p.a. F.S.S.U. and family allowance benefits.

Applications (12 copies) should be lodged, not later than 3rd October, 1956, with the undersigned, from whom further particulars may be obtained.

ROBT. T. HUTCHESON, Secretary of University Court.

UNIVERSITY COLLEGE, Ibadan, Nigeria. Applications are invited for (*a*) SENIOR LECTURESHIP and (*b*) LECTURESHIP IN PREVENTIVE AND SOCIAL MEDICINE. Revised salary scales : (*a*) £1850–£100–£2450 p.a.; (*b*) £1700–£100–£2100 p.a. Allowance up to 3 children, £50 p.a. per child resident in Nigeria, £100 p.a. per child resident elsewhere. Part furnished accommodation at rent up to 7.7% of salary. Passages for appointee, wife, and up to 3 children under 11 years on appointment, overseas leave and termination. F.S.S.U. Outfit allowance £60. Appointments initially 3 years.

Detailed applications (10 copies), naming 3 referees, by 29th September, 1956, to Secretary, Senate Committee on Colleges Overseas in Special Relation, University of London, Senate House, W.C.1, from whom further particulars may be obtained.

Hospital Services : Senior Appointments

NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD.

(1) 2 CONSULTANT OPHTHALMOLOGISTS, each to undertake 2 half-days a week (outpatients) at West Middlesex Hospital, Isleworth (1139 Beds), and 1 half-day a week (operating session) at South Middlesex Hospital, Mogden-lane, Isleworth (ophthalmic ward of 29 Beds).

Applications before 8th October, 1956.

(2) CONSULTANT DERMATOLOGIST (1 half-day a week), King Edward Memorial Hospital, Ealing (to include duties at Perivale Maternity and Clayponds Hospitals—total beds 331).

Applications before 11th October, 1956.

(3) ASSISTANT PSYCHIATRIST (Senior Hospital Medical Officer grade), Child Guidance Training Centre, 6, Osnaburgh-street, N.W.1, for 4 half-days a week. Applicants should have undergone training in child psychiatry and had some subsequent experience.

Applications before 15th October, 1956.

Hospitals and Centre may be visited by direct appointment.

(4) CONSULTANT OTOLOGIST, initially 1 session per week, to Heston School for the Deaf, Vicarage Farm-road, Heston, and Director of the Audiology Unit to be established. The successful candidate will be responsible for the development of this Unit which will undertake the diagnosis and auditory training of the deaf and partially deaf pre-school child and the care of the older partially deaf child in ordinary schools. Candidates should have considerable experience of this type of work. Unit may be visited by arrangement with the Area Medical Officer, 92, Bath-road, Hounslow.

Applications before 17th October, 1956.

Application forms obtainable from, and returnable to, Secretary, North West Metropolitan Regional Hospital Board, 11A, Portland-place, W.1.

HOSPITALS FOR DISEASES OF THE CHEST. The Board of Governors invites applications for the appointment of CONSULTANT RADIOLOGIST (diagnostic) tenable, in the first instance, at London Chest Hospital. Applicants must hold a Diploma in Diagnostic Radiology. The duties involve attendance on 3 half-days each week (Mondays, Wednesdays and Fridays) at the Hospital, Victoria Park, E.2, and 1 half-day in alternate weeks at the Hospital's Country Unit at Arlesey, near Letchworth.

Applications (12 copies), stating date of birth, qualifications and experience in full, with names of 3 referees, to reach the undersigned not later than 22nd September, 1956.

KENNETH A. F. MILES, Secretary to the Board.

Brompton Hospital, S.W.3.

NORTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD.

Full-time or maximum Part-time CONSULTANT RADIOTHERAPIST to North Middlesex Hospital, N.18, and annexes. Duties will be concerned with work of Regional Radiotherapy Sub-centre and supervision of Radioactive Isotope Laboratory.

Maximum Part-time CONSULTANT RADIOLOGIST to Epping Group of hospitals (mainly at St. Margaret's Hospital, Epping, Essex).

Full-time ASSISTANT PSYCHIATRIST (Senior Hospital Medical Officer grade) at Warley Hospital, Brentwood, Essex. House available.

Applications (6 copies) and names of 3 referees, should reach the Secretary, 11A, Portland-place, London, W.1, by Saturday, 22nd September.

SOUTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for an appointment as Part-time CONSULTANT OBSTETRICIAN AND GYNÆCOLOGIST for 4 notional half-days a week in the Bermondsey and Southwark Group of hospitals. Candidates must have had wide experience in obstetrics and gynæcology and be Members of the Royal College of Obstetricians and Gynæcologists. The possession of other higher qualifications is desirable. The appointment will be in accordance with the terms and conditions of service of hospital medical and dental staffs (England and Wales). Candidates may visit the hospitals concerned.

Apply, stating nationality, age, qualifications, and experience, including details of present appointment and war service, together with the names and addresses of 3 referees, to the Secretary, Advisory Appointments Committee, South East Metropolitan Regional Hospital Board, 11, Portland-place, London, W.1, not later than 22nd September, 1956.

BARROW AND FURNESS HOSPITAL MANAGEMENT COMMITTEE. Locum Tenens ANÆSTHETIST required for period of at least 6 months, commencing as soon as possible, in the Barrow and Furness Group of hospitals. Remuneration 31½ guineas per week, or 45 guineas per week if medical practitioner appointed has a personal grading of Consultant.

Applications to Group Secretary, 105, Abbey-road, Barrow-in-Furness, immediately.

BIRMINGHAM REGIONAL HOSPITAL BOARD.

(1) **Dudley Road Hospital** (780 Beds)

2 Whole-time ASSISTANT RADIOLOGISTS (£1575–£2025 p.a.). Diploma Diagnostic Radiology/wide experience specialty essential.

(2) **Birmingham (Dudley Road) Group of Hospitals**

Whole-time CONSULTANT PATHOLOGIST. Duties mainly at Dudley Road Hospital, Birmingham. Higher qualification/wide experience specialty essential.

(3) **All Saints' Hospital, Birmingham** (1358 Beds)

Whole-time ASSISTANT PSYCHIATRIST (£1575–£2025 p.a.). Duties also at ancillary premises. Experience specialty required. D.P.M. an advantage.

Applications (15 copies), naming 3 referees, to Secretary, Regional Hospital Board, 10, Augustus-road, Birmingham, 15, by 24th September.

BIRMINGHAM. THE UNITED BIRMINGHAM HOSPITALS. The Board of Governors invite applications for the appointment of Part-time CONSULTANT PÆDIATRICIAN on the basis of 7 notional half-days per week; 5 at the Children's Hospital and 2 at the Birmingham Maternity Hospital. The successful candidate may be required to undertake postgraduate studies in other approved centres either in this country or abroad, before formally taking up his appointment in December, 1957. For this purpose a Fellowship will be available which will include travelling expenses, subsistence allowance and a basic salary.

Applications, naming 3 referees, must be submitted on a form to be obtained from the Secretary to the Board of Governors, Queen Elizabeth Hospital, Birmingham, 15, and returned by 13th October, 1956.

CARDIFF. THE UNITED CARDIFF HOSPITALS. Applications are invited for the appointment of SENIOR CASUALTY OFFICER at the Cardiff Royal Infirmary. The salary scale for this post will be within the range applicable to Senior Hospital Medical Officers. The appointment is for a period of up to 4 years.

Application forms can be obtained from the Secretary to the Board at Cardiff Royal Infirmary, Cardiff, and should be returned within 14 days of the appearance of this advertisement.

CARSTAIRS, LANARKSHIRE. STATE INSTITUTION AND MENTAL HOSPITAL. GENERAL BOARD OF CONTROL FOR SCOTLAND. The Board invite applications for the post (Consultant status) of PHYSICIAN-SUPERINTENDENT (Psychiatrist) at the above-mentioned Institution. Candidates must be fully qualified and registered medical practitioners. Experience in prisons or in dealing with mental patients or defectives who are dangerous is desirable. Salary £2100–£3100.

Application forms which must be returned by 1st October, 1956, from Secretary (Room 33), General Board of Control for Scotland, St. Andrew's House, Edinburgh, 1.

BRENTWOOD, ESSEX. WARLEY HOSPITAL. Locum SENIOR HOSPITAL MEDICAL OFFICER or SENIOR REGISTRAR required immediately for approximately 5 months. Male or Female, married or single. Single accommodation available. Salary according to scale.

Apply to Physician-Superintendent.

GLOUCESTER. BARNWOOD HOUSE REGISTERED HOSPITAL (outside the National Health Service). Applications are invited for the post of DEPUTY MEDICAL SUPERINTENDENT. Candidates should possess the D.P.M., and, if possible, the M.R.C.P. The successful candidate will be expected to take an active part in the research work of the Hospital, in addition to routine medical duties. Salary (with emoluments) according to experience and qualifications. Pension scheme.

Applications, together with names of personal referees, and stating experience, present salary and nationality, to be sent to the Medical Superintendent before 16th September, 1956.

OXFORD REGIONAL HOSPITAL BOARD. Assistant ANÆSTHETIST (whole-time, Senior Hospital Medical Officer grade) to the Oxford and Banbury Area Department. Duties mainly in the hospitals of the Banbury and District Hospital Management Committee. Applicants should hold a higher qualification in anæsthetics.

Applications (12 copies), stating age, qualifications, experience, and the names of 3 referees, should reach the Secretary, 43, Banbury-road, Oxford, by 29th September, 1956.

OXFORD REGIONAL HOSPITAL BOARD: SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. CONSULTANT PÆDIATRICIAN (part-time—9 sessions), in the Wiltshire/Gloucestershire area. 6 of the sessions will be with the Swindon/Cirencester area department and 3 with the Salisbury Group of hospitals. Wide experience and a higher medical qualification are essential. The successful candidate will be required to live in the Marlborough area.

Applications (12 copies), stating name, age, qualifications and experience, together with the names of 3 referees, should reach the Secretary, Oxford Regional Hospital Board, 43, Banbury-road, Oxford, not later than 6th October, 1956.

OXFORD REGIONAL HOSPITAL BOARD. Consultant PSYCHIATRIST (Deputy Physician-Superintendent) to the Pewsey Mental Deficiency Hospital and Ancillary premises (960 Beds). Whole-time or maximum part-time. Residential accommodation available. Candidates must hold the D.P.M. and be familiar with the statutory responsibilities prescribed by the M.D. acts and regulations. The hospitals may be visited by arrangement with the Secretary, Pewsey Hospital, Pewsey, Wilts.

Applications (12 copies), stating age, qualifications, experience and the names of 3 referees, to the Secretary, Oxford Regional Hospital Board, 43, Banbury-road, Oxford, by 6th October, 1956.

SCOTLAND. NORTHERN REGIONAL HOSPITAL BOARD. Applications are invited for the whole-time post of ASSISTANT PSYCHIATRIST (Senior Hospital Medical Officer grade), at Craig Dunain Hospital, Inverness. House available.

Forms of application and further particulars may be obtained from the undersigned with whom applications should be lodged by 29th September, 1956.

A. M. FRASER, M.D.
Secretary and Administrative Medical Officer.
Office of the Northern Regional Hospital Board,
Raigmore, Inverness.

SCOTLAND. NORTH-EASTERN REGIONAL HOSPITAL BOARD. Applications are invited for the whole-time post of PHYSICIAN-SUPERINTENDENT AND CONSULTANT PSYCHIATRIST at Kingseat Hospital, Newmachar, Aberdeenshire. Candidates should be possessed of an appropriate higher qualification and have wide experience in psychiatric work and mental hospital administration. The officer appointed will also be required to take part in the work of psychiatric clinics conducted in association with general hospitals in the Region. A residence, for which a rental is charged at an approved rate, is available in the grounds of the Hospital.

Further information relative to the appointment may be obtained from the Secretary of the Board, P.O. Box No. 28, 1, Albyn-place, Aberdeen, and applications (12 copies) together with the names of 2 referees, lodged with him not later than Monday, 1st October, 1956.

SCOTLAND. WESTERN REGIONAL HOSPITAL BOARD. Applications are invited for the appointment of Whole-time CONSULTANT PATHOLOGIST based at Hairmyres Hospital, East Kilbride, for duties in Lanarkshire. This appointment is subject to the National Health Service (Scotland) superannuation regulations.

Applications (16 copies), stating date of birth, qualifications, experience, present appointment, and the names of 3 referees, to reach the Secretary, Western Regional Hospital Board, 64, West Regent-street, Glasgow, C.2, not later than 30 days after the publication of this advertisement.

SHEFFIELD REGIONAL HOSPITAL BOARD. Whole-time ASSISTANT OPHTHALMOLOGIST required with duties at Leicester Royal Infirmary and associated clinics. Salary scale £1575–£2025.

Application forms and further details from Senior Administrative Medical Officer, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield, forms to be returned by 29th September, 1956.

SHEFFIELD REGIONAL HOSPITAL BOARD. Whole-time SENIOR CASUALTY OFFICER required at the Royal Infirmary, Doncaster. Salary within the range of £1575–£2025. Tenure for a period not exceeding 4 years.

Application forms and further details from Senior Administrative Medical Officer, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield. Forms to be returned by 6th October, 1956.

SOUTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited to fill a vacancy for a CONSULTANT ANÆSTHETIST (part-time 4 notional half-days a week) at the Orpington and Sevenoaks Group of hospitals for duties at Orpington Hospital, Orpington, Kent. Candidates must have had wide experience in anæsthetics and hold the qualification of D.A. or preferably F.F.A.R.C.S. Applicants may visit the Hospital concerned.

Apply, stating nationality, age, sex, qualifications, and experience, including details of present appointment and of war service, together with the names and addresses of 3 referees, to the Secretary, Advisory Appointments Committee, South East Metropolitan Regional Hospital Board, 11, Portland-place, W.1, not later than 15th September, 1956.

SOUTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for appointment as Part-time CONSULTANT in Physical Medicine to undertake 4 notional half-days a week in the Orpington and Sevenoaks Group of hospitals. Candidates should have had considerable experience in the specialty. A higher qualification in medicine is essential and the appropriate diploma is desirable. Applicants may visit the hospitals concerned.

Apply, stating nationality, age, sex, qualifications, and experience, including details of present appointment and of war service, together with the names and addresses of 3 referees, to the Secretary, Advisory Appointments Committee, South East Metropolitan Regional Hospital Board, 11, Portland-place, W.1, not later than 15th September, 1956.

SOUTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for an appointment as Part-time CONSULTANT in E.N.T. Surgery for 3 notional half-days a week, in the Orpington and Sevenoaks Group of hospitals, for duties at Orpington Hospital, Orpington, Kent. Candidates must have had wide experience in E.N.T. surgery and be Fellows of a Royal College of Surgeons. The appointment will be in accordance with the terms and conditions of service of hospital medical and dental staffs (England and Wales). Candidates may visit the Hospital concerned.

Apply, stating nationality, age, sex, qualifications, and experience, including details of present appointment and of war service, together with the names and addresses of 3 referees, to the Secretary, Advisory Appointments Committee, South East Metropolitan Regional Hospital Board, 11, Portland-place, London, W.1, not later than 15th September, 1956.

SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD requires a Locum Tenens PHYSICIAN (Consultant or Senior Hospital Medical Officer) for 7 half-days per week in the Bournemouth and East Dorset Group of hospitals immediately for approximately 3 months. The appointment will be in accordance with the terms and conditions of service of hospital medical and dental staffs.

Applications (2 copies), stating age, qualifications, experience, and names and addresses of 3 referees, to the Area Secretary, Highcroft, Romsey-road, Winchester, by 15th September, 1956.

NEW ZEALAND. WAIKATO HOSPITAL, Hamilton, NEW ZEALAND. Applications are invited from qualified medical practitioners of the British Empire possessing a Diploma in Diagnostic Radiology for the following positions at the above Hospital.

SENIOR RADIOLOGIST to assume direction of Diagnostic X-ray Departments under the Board's control. Salary in accordance with the Hospital Employment Regulations and within the range of New Zealand £2000–New Zealand £2550, non-resident.

ASSISTANT RADIOLOGIST required for Diagnostic X-ray Department in the Waikato Hospital. Salary in accordance with the Hospital Employment Regulations and within the range of New Zealand £1600–New Zealand £1900, non-resident.

Conditions of appointment and form of application obtainable from the High Commissioner for New Zealand, 415, Strand, London, W.C.2. Applications close on 19th October, 1956.

A. C. BURGESS, Secretary.
Waikato Hospital Board, P.O. Box 934,
Hamilton, New Zealand.

WESTERN AUSTRALIA. ROYAL PERTH HOSPITAL. Applications are invited for the full-time post as STAFF RADIOTHERAPIST who will work under the direction of the Honorary Radiotherapists. Salary within the range of £A2360–£A2540 p.a. according to qualifications and experience, and provided the applicant has the Diploma of Radiotherapy or the equivalent. Applicants without a complete Diploma will receive a salary of £A2097 p.a. The Royal Perth Hospital is the main Teaching Hospital associated with the University of Western Australia. It has more than 600 Beds and is extending.

In addition to all relevant personal details, applications must include particulars of qualifications, experience, and the names of 2 referees, and should reach the undersigned on or before 31st October, 1956. JOSEPH GRIFFITH, Administrator.

Hospital Services : Junior Appointments

CENTRAL MIDDLESEX HOSPITAL, Park Royal, N.W.10. NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. REGISTRAR required in Department of Physical Medicine, Central Middlesex Hospital (726 Beds). Whole-time or 9 sessions, non-resident appointment. Appointment offers broad experience in all branches of this specialty and close contact with general medical problems. Possession of Part I of D.Phys.Med. an advantage. Hospital may be visited by direct appointment.

Application forms from, and returnable to, Secretary, Central Middlesex Group Hospital Management Committee, Park Royal, N.W.10, by 18th September, 1956.

CONNAUGHT HOSPITAL, Walthamstow, E.17. Locum RESIDENT ANÆSTHETIST required, 17th–28th September, inclusive. Registrar grade.

Apply Secretary, Forest Group Hospital Management Committee, Langthorne-road, E.11.

DREADNOUGHT SEAMEN'S HOSPITAL, Greenwich, S.E.10. HOUSE SURGEON (pre-registration) required at once.

Applications, stating age, nationality, qualifications, and experience with the names of 3 recent referees, should be sent to the Secretary at the above address as soon as possible.

DULWICH HOSPITAL, London, S.E.22. Applications invited for appointment as SENIOR HOUSE OFFICER (Pathologist), resident post, for 6 months in first instance.

Apply, giving details of age, qualifications and previous posts, with copy testimonials, or names of 2 referees, to Group Secretary, Camberwell Hospital Management Committee, Dulwich Hospital, S.E.22, not later than 21st September.

EASTERN HOSPITAL (Fevers), London, E.9. Registered RESIDENT HOUSE PHYSICIAN. Duties may include some work in Chest Unit. Facilities for postgraduate study for higher qualifications.

Applications to Group Secretary, Hackney Hospital, London, E.9, by 21st September, quoting EH/HO.

ELIZABETH GARRETT ANDERSON HOSPITAL, Euston-road, N.W.1. (ROYAL FREE HOSPITAL GROUP.) Applications are invited from pre-registration and registered Women medical practitioners for the post of HOUSE SURGEON to Gynecological Department (recognised for M.R.C.O.G.). Duties to commence 1st November, 1956. Appointment for 6 months. Salary in accordance with Ministry of Health scale for House Officers.

Applications, with copies of 3 recent testimonials, should be sent to the Secretary, Elizabeth Garrett Anderson Hospital by 12th September, 1956.

ELIZABETH GARRETT ANDERSON HOSPITAL, Euston-road, N.W.1. (ROYAL FREE HOSPITAL GROUP.) Applications are invited from pre-registration and registered Women medical practitioners for the post of SECOND HOUSE PHYSICIAN. Appointment for 6 months from 1st November, 1956. Salary according to Ministry of Health scale for House Officers.

Applications, with copies of 3 recent testimonials, should be sent to the Secretary, Elizabeth Garrett Anderson Hospital, by 12th September, 1956.

HACKNEY HOSPITAL, London, E.9. (General—841 Beds.) Applications are invited for appointment as SENIOR HOUSE OFFICER ANÆSTHETIST. The post, shortly vacant, is recognised for the D.A. and the F.F.A.R.C.S. examinations and offers wide experience of anæsthesia and opportunities of study for higher qualifications.

Apply Secretary, above address, by 24th September, quoting HH/SHO/A.

KING'S COLLEGE HOSPITAL, Denmark-hill, S.E.5. Applications are invited for the post of Whole-time SENIOR REGISTRAR in Orthodontics. Applicants should preferably hold a higher qualification. The appointment which is subject to the terms and conditions of service for medical and dental staffs will be tenable from 1st January, 1957, for 1 year in the first instance, subject to reappointment.

Applications, stating age, education, qualifications and experience, with the names of 2 referees, should be sent to the undersigned by 22nd September, 1956.

S. W. BARNES, House Governor.

MARLBOROUGH DAY HOSPITAL, Marlborough-place, N.W.8. NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. PSYCHIATRIC REGISTRAR for 8 or possibly 11 sessions per week, including some evening sessions, commencing October, 1956. Successful applicant required to undergo personal analysis, which will be given free of charge. Clinic may be visited by direct appointment.

Application forms from, and returnable to, Group Secretary, Central Middlesex Group Hospital Management Committee, Acton-lane, N.W.10, by 18th September, 1956.

MIDDLESEX HOSPITAL, W.1. Applications invited for posts of SENIOR REGISTRAR and REGISTRAR in Anæsthetics, vacant 1st January.

Rules and application forms, obtainable from Deputy Superintendent, should be returned, naming 2 referees, by 29th September.

MIDDLESEX HOSPITAL, W.1. Applications invited for post of SENIOR REGISTRAR to E.N.T. Department, vacant 1st January.

Rules and application forms, obtainable from Deputy Superintendent, should be returned, naming 2 referees, by 29th September.

MIDDLESEX HOSPITAL, W.1. Applications invited for 4 posts of MEDICAL REGISTRAR, vacant 1st January.

Rules and application forms, obtainable from Deputy Superintendent, should be returned, naming 2 referees, by 29th September.

MIDDLESEX HOSPITAL, W.1. Applications invited for post of SURGICAL REGISTRAR, vacant 1st January.

Rules and application forms, obtainable from Deputy Superintendent, should be returned, naming 2 referees, by 29th September.

NEW END HOSPITAL, N.W.3. North West Metropolitan REGIONAL HOSPITAL BOARD. ANÆSTHETIC REGISTRAR for busy General Hospital of 221 Beds, with Endocrine Unit (including thyroid surgery) in the Archway Group. Post recognised for D.A. Hospital may be visited by direct appointment.

Application forms from and returnable to, Group Secretary, 46, Cholmeley-park, N.6, by 18th September, 1956.

NORTH MIDDLESEX HOSPITAL, Edmonton, N.18. RESIDENT HOUSE ANÆSTHETIST (House Officer), required for 16th October. 6 months appointment. Post recognised for D.A. and F.F.A.R.C.S. Whole-time duties under supervision of Senior Anæsthetists.

Applications, stating age, nationality, qualifications, experience, with copies of recent testimonials, to Secretary of Hospital, by 18th September.

NATIONAL HEART HOSPITAL, Westmoreland-street, W.1, and MAIDS MORETON, BUCKINGHAM. Locum RESIDENT MEDICAL OFFICER required for the Hospital's country branch at Buckingham from 8th to 24th October, inclusive.

Applications should be sent to the Secretary at Westmoreland-street not later than 14th September, 1956.

NELSON HOSPITAL, Kingston-road, Merton, S.W.20. RESIDENT ANÆSTHETIST (Senior House Officer grade).

Applications, stating age, experience and qualifications, with copies of testimonials and the name of 1 referee, should be sent to the Group Secretary, St. Helier Hospital, Carshalton, Surrey.

PRINCE OF WALES'S GENERAL HOSPITAL, The Green, London, N.15. (248 Beds.) Applications are invited from registered medical practitioners for the appointment of SENIOR HOUSE OFFICER RESIDENT ANÆSTHETIST, for a period of 6 months, vacant on 8th October. Post recognised for F.F.A.R.C.S.

Application form from Secretary to be returned by 22nd September.

QUEEN MARY'S HOSPITAL FOR THE EAST END, Stratford, London, E.15. HOUSE PHYSICIAN (third post) for 6 months commencing 6th November, 1956.

Applications, with copies of recent testimonials, to Hospital Secretary by 21st September, 1956.

QUEEN MARY'S HOSPITAL FOR THE EAST END, Stratford, London, E.15. SENIOR CASUALTY OFFICER (Male or Female: Senior House Officer grade) for 1 year commencing as soon as possible after 1st October, 1956. Post recognised for F.R.C.S. (i.e., half the year is recognised as casualty and half as general surgery).

Applications, with copies of recent testimonials, to Group Secretary, West Ham Group Hospital Management Committee, Stratford, E.15, by 21st September, 1956.

ROYAL MARSDEN HOSPITAL, Fulham-road, S.W.3. Applications are invited for the post of SURGICAL SENIOR REGISTRAR to begin duty on 1st November, 1956. The appointment will be for 6 sessions. Candidates must hold the Diploma of F.R.C.S.

Applications, quoting the names of 3 referees, should be submitted by 1st October, on a form which may be obtained from the House Governor.

ROYAL MASONIC HOSPITAL, Ravenscourt Park, London, W.6. Applications are invited for the post of RESIDENT MEDICAL REGISTRAR. Appointment about 1st November. Gross salary: first year £850 (residential emoluments of £130 deductible); second year £965 (residential emoluments of £145 deductible).

Please state age, qualifications, past and present appointments and include 2 recent testimonials and/or the names of 2 referees. Applications should reach the undersigned (from whom further information may be obtained) as soon as possible, and in any event not later than 20th September.

R. E. LAWSON, Secretary and House Governor.

SOUTH LONDON HOSPITAL FOR WOMEN, Clapham Common, S.W.4. Applications are invited from pre-registration and registered Female medical practitioners for the appointment of OBSTETRIC HOUSE SURGEON at the above Hospital. Recognised for the M.R.C.O.G.; appointment is for 6 months from 23rd October, 1956.

Forms for application from the Secretary.

SOUTH LONDON HOSPITAL FOR WOMEN, Clapham Common, S.W.4. Applications are invited from pre-registration and registered Female medical practitioners for the appointment of GYNÆCOLOGICAL HOUSE SURGEON at the above Hospital, vacant 6th November, 1956, for 6 months. Recognised for the M.R.C.O.G.

Application forms from the Secretary.

SOUTH LONDON HOSPITAL FOR WOMEN AND CHILDREN, Clapham Common, S.W.4. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for the post of Part-time MEDICAL REGISTRAR (7 sessions weekly), vacant on 1st November, 1956. The appointment will be for 1 year in the first instance. A higher qualification in medicine is desirable. Canvassing will disqualify but candidates are not precluded from visiting the Hospital.

For forms of application apply (enclosing stamped addressed envelope) to the Secretary, Lambeth Group Hospital Management Committee, Renfrew-road, S.E.11, to whom completed forms should be returned not later than 22nd September, 1956.

ST. GEORGE'S HOSPITAL, S.W.1. Applications are invited for the post of REGISTRAR to the Fever Unit at the Grove Hospital, Tooting, S.W.17. A good knowledge of general medicine is required, but experience of infectious diseases is not essential. The appointment is for 1 year in the first instance, and the successful candidate will be required to take up duty as soon as possible.

Applications, stating age, education, qualifications, experience, and the names of 2 referees, should reach the undersigned not later than 22nd September, 1956.

P. H. CONSTABLE, House Governor.

ST. LEONARD'S HOSPITAL, Nuttall-street, London, N.1. (Acute General—192 Beds.) Applications are invited from registered or provisionally registered medical practitioners for the post of HOUSE SURGEON. Post vacant 14th October, 1956.

Applications, with copies of 2 testimonials, to the Hospital Secretary by 21st September, 1956.

ST. OLAVE'S HOSPITAL, Lower-road, Rotherhithe, S.E.16. BERMONDSEY AND SOUTHWARK GROUP HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER (general surgery and orthopædics) required at above Hospital. Salary £745 p.a., less appropriate deduction for board and lodging. The appointment is tenable for 12 months and may be either fully resident or resident only when on duty.

Applications, stating age, qualifications and experience, together with names of 3 referees or copy testimonials, to Hospital Secretary at above address within 1 week of advert.

ST. MARY'S HOSPITAL, Paddington, W.2. Applications are invited for the post of Part-time REGISTRAR to the E.N.T. Department for 2 notional half-days per week (Monday, P.M., Thursday, A.M.). The successful candidate will be required to take up his duties as soon as possible; remuneration to be at Registrar rates.

Applications, stating nationality, date of birth, permanent address, qualifications with dates, details and National Health Service gradings of previous and present appointments, together with the names and addresses of 3 referees, should reach ALAN POWDITCH, House Governor, not later than 25th September, 1956.

ST. MARY'S HOSPITAL, Paddington, W.2. Applications are invited from registered practitioners holding a Dental qualification, for the post of Whole-time NON-RESIDENT HOUSE OFFICER to the Dental Department (in new premises) under the direction of Sir Wilfred Fish and Mr. A. J. May. The appointment is for a period of 6 months in the first instance, as from a date to be arranged; remuneration to be at House Officer rates.

Applications, stating nationality, date of birth, permanent address, qualifications with dates, details and National Health Service gradings of previous and present appointments, together with the names and addresses of 3 referees, should reach ALAN POWDITCH, House Governor, not later than 25th September, 1956.

ST. NICHOLAS HOSPITAL, Plumstead, S.E.18. House OFFICER (Orthopædic, Fracture and Casualty Departments), vacant now. Recognised for F.R.C.S. 6 months resident post-registration appointment providing good general experience in a busy acute general hospital.

Apply to Group Secretary, Memorial Hospital, Woolwich, S.E.18.

ST. NICHOLAS HOSPITAL, Plumstead, S.E.18. Senior HOUSE OFFICER (anæsthetics), vacant now. Recognised for F.F.A.R.C.S. and D.A. 6 months resident appointment and may be renewed.

Apply to Group Secretary, Memorial Hospital, Woolwich, S.E.18.

ST. STEPHEN'S HOSPITAL, Chelsea, S.W.10. South WEST METROPOLITAN REGIONAL HOSPITAL BOARD. REGISTRAR to Rheumatism Unit. Non-resident. Vacancy 16th November, 1956. Post offers wide clinical and research experience both in the rheumatic diseases and general medicine. Higher qualifications in medicine desirable but not essential.

Application forms from Group Secretary, St. Luke's Hospital, Chelsea, S.W.3, to be returned within 14 days (enclose foolscap stamped addressed envelope).

ST. THOMAS'S HOSPITAL, London, S.E.1. Resident ASSISTANT PHYSICIAN (Senior Registrar grade), for a period of 1 year in the first instance from 15th February, 1957. Renewable for a second year.

Applications, naming 2 referees, to the Clerk of the Governors by 21st September, 1956.

ST. THOMAS'S HOSPITAL, London, S.E.1. Registrar to the Departments of Neurology and Psychiatry. For a period of 1 year in the first instance from 1st January, 1957. Some neurological experience essential.

Applications, naming 2 referees, to the Clerk of the Governors by 28th September, 1956.

ST. THOMAS'S HOSPITAL, London, S.E.1. Registrar to the Children's Department. For a period of 1 year in the first instance from 10th December, 1956.

Applications, naming 2 referees, to the Clerk of the Governors by 28th September, 1956.

THE HOSPITAL FOR SICK CHILDREN, Great Ormond-street, London, W.C.1. There will be a vacancy on 15th December, 1956, for a HOUSE PHYSICIAN (Senior House Officer).

Further particulars and form of application, which must be returned not later than 10th October, 1956, are obtainable from the undersigned.

H. F. RUTHERFORD, House Governor and Secretary.

UNIVERSITY COLLEGE HOSPITAL, Gower-street, W.C.1. Applications are invited for a Whole-time (or Part-time) Locum SENIOR REGISTRAR or REGISTRAR in the Dermatological Department to start duty as soon as possible on a weekly basis.

Applications, with names of 2 referees, to Administrator and Secretary by 22nd September, 1956.

WEST LONDON HOSPITAL, Hammersmith-road, W.6. RESIDENT HOUSE SURGEON (general and gynæcological) required 28th October. Pre-registration candidates considered.

Applications, stating age, qualifications, experience, copies of 2 recent testimonials, to Secretary by 22nd September.

WESTMINSTER HOSPITAL, St. John's-gardens, S.W.1. Applications invited for post of RESIDENT CASUALTY OFFICER (Senior House Officer grade) with duties as House Physician in Skin and V.D. Departments for 1 year from 1st October, 1956. Board and lodging £150 p.a.

Applications (11 copies), with names of 2 referees, to House Governor by 19th September.

WESTMINSTER HOSPITAL, St. John's Gardens, S.W.1. Applications are invited for the post of RESIDENT MEDICAL OFFICER (Female) at Parkwood Auxiliary Hospital, Swanley, Kent, for 1 year in the first instance and renewable. Graded as Junior Hospital Medical Officer. A deduction of £170 p.a. will be made from the salary for board-residence. The post offers opportunity for study.

Applications (4 copies), with names of 2 referees, to House Governor.

WHIPPS CROSS HOSPITAL, London, E.11. Leytonstone (NO. 10) HOSPITAL GROUP. Applications are invited for the post of SENIOR HOUSE OFFICER (Casualty Officer) at above Hospital. This post, which is recognised by the Royal College of Surgeons for 6 months casualty training under the Fellowship regulations, becomes vacant 23rd October, 1956.

Application forms from the Hospital Secretary to be returned by 17th September, 1956.

ALTON GENERAL HOSPITAL, Alton, Hampshire. (136 Beds.) HOUSE SURGEON (Senior House Officer grade) required to assist in busy and expanding surgical unit at this Hospital which is being developed. Work includes casualty duties. The post is recognised for the F.R.C.S. This post offers good experience in both general and gynæcological surgery.

Applications, with copies of 2 testimonials, to be sent to the Hospital Secretary.

ASHFORD HOSPITAL, Ashford, Middlesex. (560 Beds.) STAINES GROUP HOSPITAL MANAGEMENT COMMITTEE. Required, RESIDENT HOUSE OFFICER (Male) for general surgical and medical duties. 6 months appointment, vacant 15th September, 1956, not suitable for pre-registration candidates.

Applications, stating age, qualifications, and experience, with copies of up to 3 recent testimonials, to Medical Director of Hospital.

ASHFORD HOSPITAL, Ashford, Middlesex. Staines GROUP HOSPITAL MANAGEMENT COMMITTEE. Required, RESIDENT SENIOR HOUSE OFFICER (Male) for Pathology. Previous clinical experience essential but pathological experience not essential. Post vacant 1st November, 1956.

Applications, stating age, qualifications and experience, with copies of up to 3 recent testimonials, to Medical Director of Hospital.

ASHFORD HOSPITAL, Ashford, Middlesex. (560 Beds.) STAINES GROUP HOSPITAL MANAGEMENT COMMITTEE. Required, RESIDENT HOUSE OFFICER (Male) for Special Departments. (E.N.T., pædiatric, dermatology, &c.). 6 months appointment, vacant 1st November, 1956. Not suitable for pre-registration candidates ; offers good experience before general practice.

Applications, stating age, qualifications and experience, with copies of up to 3 recent testimonials, to Medical Director of Hospital.

BEDFORD (near). BROMHAM HOSPITAL. (434 Beds for mental defectives and 60 at Annexe near Sandy.) REGISTRAR in Psychiatry required (resident). Hospital may be visited by direct appointment with the Medical Superintendent (phone : Oakley 295).

Application forms obtainable from, and returnable to, Secretary, Bedford Group Hospital Management Committee, 3, Kimbolton-road, Bedford, by 17th September, 1956.

BEDFORD GENERAL HOSPITAL. (439 Beds.) North WEST METROPOLITAN REGIONAL HOSPITAL BOARD. GENERAL SURGICAL REGISTRAR (resident) required at above Hospital which may be visited by direct appointment. Post vacant October.

Application forms obtainable from, and returnable to, Group Secretary, Bedford Group Hospital Management Committee, 3, Kimbolton-road, Bedford, as soon as possible.

BEDFORD GENERAL HOSPITAL. (439 Beds.) North WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Locum GENERAL SURGICAL REGISTRAR required at above Hospital, 16th September, 1956.

Applications, giving full details of experience and names of 2 referees, to Group Secretary, Bedford Group Hospital Management Committee, 3, Kimbolton-road, Bedford.

BEDFORD GENERAL HOSPITAL. (439 Beds.) Senior HOUSE OFFICER in Medicine, now vacant, tenable for 12 months.

Applications, stating age, qualifications, experience, copies of 2 recent testimonials, to Group Secretary, Bedford Group Hospital Management Committee, 3, Kimbolton-road, Bedford.

BEVERLEY, YORKSHIRE. WESTWOOD HOSPITAL. (229 Beds.) HOUSE PHYSICIAN (House Officer or Senior House Officer grading according to experience), vacant end of September. Pre-registration post but fully qualified practitioners may apply.

Applications to Group Secretary.

BEXHILL. BEXHILL HOSPITAL. (62 Beds.) House SURGEON (resident) not pre-registration post. National scale of salary.

Apply to Hospital Administrator.

BIRMINGHAM AND MIDLAND EAR AND THROAT HOSPITAL, Edmund-street, BIRMINGHAM, 3. SENIOR HOUSE OFFICER or HOUSE OFFICER (including pre-registration) required.

Apply to Group Secretary, Dudley Road Hospital, Birmingham, 18.

BIRMINGHAM, 18. DUDLEY ROAD HOSPITAL. House PHYSICIAN (general medicine), vacant 1st November, 1956. Recognised for pre-registration. Responsible for approximately 80 male and female medical beds in a unit under control of 2 Consultant Physicians.

Applications, with copies of 2 recent testimonials, to the Group Secretary.

BIRMINGHAM. SOLIHULL HOSPITAL, Lode-lane, SOLIHULL. RESIDENT MEDICAL OFFICER (Senior House Officer), vacant mid-September. General Hospital with 5 other Resident Medical Officers.

Apply Medical Superintendent.

BIRMINGHAM REGIONAL HOSPITAL BOARD.

(1) **Shelton Hospital, Shrewsbury** (972 Beds)

SENIOR REGISTRAR in Psychiatry. Wide experience specialty and higher qualification required. Resident. Successful candidate may subsequently be required to spend not more than 2 years in a selected hospital of the United Birmingham Hospitals in accordance with arrangements for the interchange of Senior Registrars agreed by the Board.

(2) **All Saints' Hospital, Birmingham** (1358 Beds), **and Early Treatment Centre, Ufficulme**

Whole-time SENIOR REGISTRAR in Psychiatry. Candidates should be actively interested in research. D.P.M. essential. Higher medical qualification an advantage.

Application forms from Secretary, Regional Hospital Board, 10, Augustus-road, Birmingham, 15, to be returned by 24th September.

BIRMINGHAM REGIONAL HOSPITAL BOARD.

(1) **All Saints' Hospital, Winson Green, Birmingham, 18**

REGISTRAR (psychiatry) for All Saints' Hospital, Birmingham (1385 Beds) and Early Treatment Centre, Ufficulme. Candidates should be actively interested in research. Resident post ; married accommodation available.

(2) **Highcroft Hall, Group 7, Highcroft Hall Hospital, Erdington, Birmingham, 23**

REGISTRAR (psychiatry). All modern forms of treatment. Opportunities for outpatients clinic work. Resident/non-resident.

(3) **South Warwickshire Group, 50, Holly-walk, Leamington Spa**

REGISTRAR (general surgery) at Stratford-on-Avon Hospital (163 Beds). Resident. Experience specialty desirable. Recognised F.R.C.S. Furnished house available for married resident possessing car.

(4) **Shrewsbury Group (15), Royal Salop Infirmary, Shrewsbury**

REGISTRAR (radiology) (radiodiagnosis), Shrewsbury Group and Robert Jones and Agnes Hunt Orthopædic Hospital, Oswestry. Resident or non-resident.

Application forms from Group Secretaries to be returned by 17th September, 1956.

BIRMINGHAM REGIONAL HOSPITAL BOARD. Birm-INGHAM REGIONAL BLOOD TRANSFUSION SERVICE require 1 Part-time Medical Practitioner undertaking 6 notional half-days weekly. Duties attending blood-donor sessions in the Region. Remuneration £175 per session p.a.

Applications (10 copies), naming 3 referees, to Secretary, 10, Augustus-road, Birmingham, 15, by 24th September. Further information from Director, Blood Transfusion Service Centre, 15, Ampton-road, Birmingham, 15.

BIRMINGHAM, 9. YARDLEY GREEN HOSPITAL. THORACIC SURGICAL UNIT. (66 Beds.) Vacancy for SENIOR HOUSE OFFICER. No previous experience in thoracic surgery necessary.

Applications, stating age, qualifications, training and experience, together with names of 2 referees, to be addressed to Group Secretary, Yardley Green Hospital, Birmingham, 9.

BIRMINGHAM (near). MARSTON GREEN MATER-NITY HOSPITAL, Berwicks-lane, MARSTON GREEN, near BIRMINGHAM. HOUSE SURGEON (obstetrics) required, vacant 1st November. 121 obstetrics and 10 gynæcological beds. Recognised for Diploma and Obstetric part of M.R.C.O.G. Premature Baby Unit. Hospital affiliated to Birmingham Medical School for training of students.

Detailed applications, with copies of 3 recent testimonials, to Group Secretary, Dudley Road Hospital, Birmingham, 18.

BLACKPOOL VICTORIA HOSPITAL. House Physician required for the pre-registration post vacant as from 24th September.

Applications, stating age, experience (if any), qualifications and giving the names and addresses of 2 referees, should be sent to the Hospital Secretary.

BOLTON. THE ROYAL INFIRMARY. (237 Beds.) RESIDENT SENIOR HOUSE OFFICER in Orthopædic Surgery, vacant 29th October, tenable for 12 months and recognised for F.R.C.S.

RESIDENT HOUSE SURGEON for general surgical duties, vacant 18th October, tenable for 6 months and recognised under Pre-registration Service Scheme. Also recognised for F.R.C.S.

Applications, stating age, nationality, qualifications, experience, and the names of 2 referees, to Group Secretary, Bolton and District Hospital Management Committee, The Royal Infirmary, Bolton.

BRAINTREE, ESSEX. BLACK NOTLEY HOSPITAL. Locum REGISTRAR in Orthopædic and Renal Tuberculosis required from 1st to 28th October, 1956.

Applications to the Group Secretary, Colchester Hospital Management Committee, 14, Pope's-lane, Colchester, Essex.

BURY AND ROSSENDALE HOSPITAL MANAGEMENT COMMITTEE. ROSSENDALE GENERAL HOSPITAL, RAWTENSTALL. Applications are invited for the post of SENIOR HOUSE OFFICER (obstetrics and gynæcology).

Apply, stating age, qualifications, and experience, together with names of 2 referees, to H. WILKINSON, Group Secretary. Bury General Hospital, Bury, Lancs.

BURY AND ROSSENDALE HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the post of SENIOR HOUSE OFFICER in Pædiatrics. The post is based on Bury General Hospital, but will include duties at other hospitals in the Group. Post recognised for D.C.H.

Apply, stating age, qualifications, experience and names of 2 referees, to H. WILKINSON, Group Secretary.

Bury General Hospital, Bury, Lancs.

CANTERBURY. NUNNERY FIELDS HOSPITAL. (136 Beds.) Applications are invited for the post of JUNIOR HOSPITAL MEDICAL OFFICER (whole-time, non-resident) to be responsible for the day-to-day care of patients in this active geriatric hospital, under supervision of the Physician specialising in geriatrics. The appointment offers excellent clinical experience.

Applications, together with the names of 3 referees, to be sent to the Group Secretary, Central Office, Nunnery Fields Hospital, Canterbury.

CANTERBURY. KENT AND CANTERBURY HOS-PITAL. (277 Beds.) The post of PÆDIATRIC HOUSE PHYSICIAN, recognised for D.C.H., includes work in the ward and Outpatient Department and also provides experience in the care of the newborn. Opportunities exist for the study of preventive medicine among children and child guidance work. Post vacant at the end of September, 1956. National Health Service salary and conditions.

Applications, together with 2 testimonials, to be addressed to the Hospital Secretary at the above Hospital.

CANTERBURY. KENT AND CANTERBURY HOSPITAL. (277 Beds.) The post of GENERAL SURGICAL AND ORTHOPÆDIC HOUSE SURGEON, which is recognised for the F.R.C.S. Diploma, is now vacant. National Health Service salary and conditions.

Applications, together with 2 recent testimonials, to be addressed to the Hospital Secretary at the above Hospital.

CAMBRIDGE. ADDENBROOKE'S HOSPITAL. Resident ANÆSTHETIC SENIOR HOUSE OFFICER required late September for 1 year. Anæsthetic experience essential.

Apply, stating age, nationality, qualifications and experience with dates, and copies of 3 testimonials, to Secretary as soon as possible.

CAMBRIDGE. THE UNITED CAMBRIDGE HOSPITALS. SENIOR HOUSE OFFICER (resident) at Brookfields Hospital for Infectious Diseases, Poliomyelitis and Tuberculosis, with work to be arranged at Addenbrooke's Hospital. Appointment for 6–12 months although consideration might be given to applicants available for a shorter period.

Applications, stating age, qualifications and experience with dates, and copies of 3 testimonials, to Secretary, United Cambridge Hospitals, Addenbrooke's Hospital, Cambridge.

CARDIFF. GLAN ELY HOSPITAL, Fairwater, Cardiff. (240 Beds.) SENIOR HOUSE OFFICER (resident) required at above Hospital for treatment of pulmonary (Thoracic Unit) and all forms of non-pulmonary tuberculosis.

Form of application from Group Secretary, Cardiff Hospital Management Committee, 44, Cathedral-road, Cardiff.

CARDIFF HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER in Obstetrics and Gynæcology required. Appointment recognised for M.R.C.O.G.

Further particulars and form of application from Group Secretary, 44, Cathedral-road, Cardiff.

CARLISLE. GARLANDS HOSPITAL. (1060 Beds.) GARLANDS HOSPITAL MANAGEMENT COMMITTEE. Applications are invited from registered medical practitioners for the post of SENIOR HOUSE OFFICER at the above Mental Hospital. Salary £745 p.a. Flat is available for which a deduction will be made. Appointment is subject to the National Health Service superannuation regulations and to the conditions and terms of service laid down by the Minister of Health.

Applications, stating age, qualifications and experience, and the names of 2 referees, should be sent to the Medical Superintendent as soon as possible.

CHEPSTOW, MONMOUTHSHIRE. ST. LAWRENCE HOSPITAL. (127 plastic surgery, 50 orthopædic beds.) PLASTIC SURGERY, JAW INJURIES AND BURNS CENTRE. SENIOR HOUSE OFFICER in Plastic Surgery required. Previous experience in specialty not essential. The Hospital intakes from most of Wales and the successful candidate will receive a thorough training. There is a second Senior House Officer in plastic surgery and also a Senior House Officer in orthopædics, Senior Registrar, non-resident, and 2 Registrars, all in plastic surgery, resident. Salary £745, less £150 board-residence.

Write, quoting 2 referees, to T. A. JONES, Group Secretary, 64, Cardiff-road, Newport, Mon.

CHERTSEY, SURREY. ST. PETER'S HOSPITAL. (430 Beds.) RADIOLOGICAL REGISTRAR. 1 of the 2 Registrar posts in the Diagnostic X-ray Department will become vacant at the end of September, 1956. Applicants must possess at least the D.M.R.(D.) Part I.

Application forms may be obtained from the Group Secretary, Woking and Chertsey Hospital Management Committee, "Huntingdon," Guildford-road, Chertsey, Surrey; completed forms must be returned by 14th September, 1956. The Department may be visited by arrangement with the Senior Radiologist (Ottershaw 441). Hospital within easy reach of London.

CHESTERFIELD ROYAL HOSPITAL. Senior House OFFICER required 1st October at above Hospital for Accident and Orthopædic Department. Post recognised for F.R.C.S. training and offers valuable experience. National salary and conditions.

Apply M. H. BOONE, Secretary, Chesterfield Hospital Management Committee.

CLACTON AND DISTRICT HOSPITAL, Clacton-on-Sea. (58 Beds.) Applications invited for post of SENIOR HOUSE OFFICER (Resident Surgical Officer). Post tenable for 1 year.

Applications, with copies of 3 testimonials, to Group Secretary, Colchester Hospital Management Committee, 14, Pope's-lane, Colchester, Essex.

COLCHESTER. ESSEX COUNTY HOSPITAL. (188 Beds.) Applications invited for posts of:—

SENIOR HOUSE OFFICER (anæsthetics). Post tenable for 1 year. Recognised for F.F.A.R.C.S. and D.A. The successful candidate will be called upon to give anæsthetics in other hospitals in the Group.

SENIOR HOUSE OFFICER to Casualty and E.N.T. Departments. Post tenable for 6 months or 1 year. Recognised for F.R.C.S.

Applications, with copies of 3 testimonials, to Group Secretary, Colchester Hospital Management Committee, 14, Pope's-lane, Colchester, Essex.

CROYDON. MAYDAY HOSPITAL. (611 Beds.) Croydon GROUP HOSPITAL MANAGEMENT COMMITTEE. Locum Tenens JUNIOR CASUALTY OFFICER (Senior House Officer grade) required for period 8th–21st October, inclusive.

Applications to— GEORGE A. PAINES, Group Secretary, Hospital Management Committee.

General Hospital, London-road, Croydon.

CROYDON. ST. MARY'S MATERNITY HOSPITAL. (33 Beds.) CROYDON GROUP HOSPITAL MANAGEMENT COMMITTEE. OBSTETRIC HOUSE SURGEON (resident). Post, recognised for D.Obst.R.C.O.G., vacant from 22nd September, 1956.

Application forms obtainable from GEORGE A. PAINES, Secretary, Hospital Management Committee, General Hospital, Croydon.

CUCKFIELD HOSPITAL, Cuckfield, near Haywards HEATH, SUSSEX. RESIDENT JUNIOR HOUSE PHYSICIAN (pre-registration post). Appointment vacant 1st October, 1956, tenable for 6 months. Health Service terms and conditions.

Applications, stating age, nationality, qualifications and experience, to the Group Secretary, Mid-Sussex Hospital Management Committee, as soon as possible.

DARTFORD, KENT. STONE HOUSE HOSPITAL. (For Nervous and Mental Disorders.) DARENTH AND STONE HOSPITAL MANAGEMENT COMMITTEE. Locum Tenens SENIOR HOUSE OFFICER (resident) wanted for an indefinite period.

Apply to the Physician-Superintendent.

DORCHESTER. DORSET COUNTY HOSPITAL. West DORSET GROUP HOSPITAL MANAGEMENT COMMITTEE. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for the post of SURGICAL REGISTRAR (Registrar grade) at above Hospital. Salary according to experience, with a deduction at the rate of £170 p.a. for residence. Canvassing will disqualify, but Hospital may be visited by arrangement.

Application form, obtainable from Group Secretary, West Dorset Group Hospital Management Committee, Damers-road, Dorchester, Dorset, to be returned by Monday, 17th September, 1956.

DUDLEY, STOURBRIDGE AND DISTRICT HOSPITAL GROUP. BIRMINGHAM REGION.

The Guest Hospital, Dudley (154 Beds)

SENIOR HOUSE OFFICER (casualty). Post now vacant.
SENIOR HOUSE OFFICER (anæsthetics). Post now vacant.
SENIOR HOUSE OFFICER (surgical). Post now vacant.

Wordsley Hospital, near Stourbridge (478 Beds)

SENIOR HOUSE OFFICER (surgical). Post vacant October, 1956.

Apply, Group Secretary, Guest Hospital, Dudley.

EDGWARE GENERAL HOSPITAL, Edgware, Middlesex. Locum CASUALTY SENIOR HOUSE OFFICER required for 2 weeks from 23rd September, 1956, at above Hospital.

Apply immediately to Medical Director (Telephone: EDGware 2381).

EDINBURGH NORTHERN GROUP OF HOSPITALS. RESIDENT ANÆSTHETIST required for Leith Hospital. Salary scale £425–£525.

Applications, giving names of 2 referees, to the Medical Superintendent, Western General Hospital, Edinburgh, 4.

EDINBURGH. ROYAL EDINBURGH HOSPITAL FOR MENTAL AND NERVOUS DISORDERS BOARD OF MANAGEMENT. Applications are invited for the appointment of SENIOR HOUSE OFFICER to work in the Professorial Unit of the Jordanburn Nerve Hospital, which is attached to the University Department of Psychological Medicine. The post also includes outpatient and inpatient work at the Royal Infirmary, Edinburgh. Appointment is for 1 year from 1st October, 1956. Single accommodation available.

Applications, giving details of experience and the names of 2 referees, should be made within 2 weeks of the appearance of this advertisement, to the Group Secretary and Treasurer, The Royal Edinburgh Hospital for Mental and Nervous Disorders, 40, Colinton-road, Edinburgh, 10.

EXETER. ROYAL DEVON AND EXETER HOSPITAL. Applications are invited from pre-registration and registered medical practitioners for the appointment of HOUSE SURGEON (general surgery), vacant 30th October, 1956.

Applications, with copies of 2 recent testimonials, to the Hospital Secretary on or before 15th September, 1956.

FARNBOROUGH HOSPITAL, Kent. (800 Beds.) Orthopædic SENIOR HOUSE OFFICER required for 1 year from 1st October. Recognised for F.R.C.S. Deduction for residence £150.

Apply, stating age, qualifications with dates, and experience, and naming 3 referees, to Administrative Officer by 15th September.

GLOUCESTER. HORTON ROAD AND CONEY HILL HOSPITALS. (1450 Beds.) Applications invited for the appointment of a JUNIOR HOSPITAL MEDICAL OFFICER. Hospital serves the North Gloucestershire Clinical Area including Gloucester, Cheltenham, Stroud and Forest of Dean. High admission-rate (800). All modern methods of treatment. New units provided for treatment of neurosis and alcoholism. Expanding outpatient services, long-stay annexes, and social clubs. Encouragement and opportunity for study. Salary and conditions Whitley Council. Single accommodation available. Married accommodation possibility.

Applications, with names of 3 referees, to Physician-Superintendent within 14 days.

GUILDFORD GROUP HOSPITAL MANAGEMENT COMMITTEE. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. The post of Full-time REGISTRAR to the Orthopædic and Traumatic Unit (60 Beds) serving the Group will become vacant on 8th November, 1956. The appointment is for 1 year in the first instance and may be renewed for a further year. It is non-resident and the candidate appointed will be required to live within a short distance of Royal Surrey County Hospital. The post provides good facilities for training and experience in short-term orthopædic and traumatic surgery. The Hospital may be visited by arrangement.

Application forms from Group Secretary, St. Luke's Hospital, Guildford, to whom they should be returned by 22nd September, 1956.

HITCHIN. LISTER HOSPITAL. (317 Beds.) North WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Whole-time MEDICAL REGISTRAR required at above Hospital. Post gives good all-round experience, valuable for the M.R.C.P. Vacant 22nd November, 1956. Hospital may be visited by direct appointment.

Application forms obtainable from the Secretary, Luton and Hitchin Group Hospital Management Committee, St. Mary's Hospital, Luton, Beds, and returnable by 24th September, 1956.

GRIMSBY GENERAL HOSPITAL. Grimsby Hospital MANAGEMENT COMMITTEE. Applications are invited for the post of SENIOR HOUSE OFFICER (orthopædic). Orthopædic Unit of 74 Beds. Resident establishment—Registrar and 2 House Officers. Up-to-date Medical Library and reading facilities available.

Applications, with names of 2 referees, to Hospital Secretary.

HASTINGS AND ST. LEONARDS. BUCHANAN HOSPITAL. (94 Beds.) HOUSE SURGEON in Gynæcology (28 gynæcological beds). Post, recognised for M.R.C.O.G., vacant 22nd September for 6 months. Candidates for Pre-registration Service (surgery) can be considered.

Apply, giving names of 3 referees, to Hospital Administrator.

HASTINGS. ROYAL EAST SUSSEX HOSPITAL. (150 Beds.) SENIOR HOUSE OFFICER (casualty and orthopædic). Post vacant now.

Apply to Hospital Administrator.

HILLINGDON HOSPITAL, Uxbridge, Middlesex. (621 Beds.) REGISTRAR in Surgery for general and genito-urinary work.

Application forms obtainable from, and returnable to, Hospital Secretary by 18th September.

HOLT, NORFOLK. KELLING HOSPITAL AND DEPARTMENT OF THORACIC SURGERY. Applications are invited for the appointment of Locum JUNIOR HOSPITAL MEDICAL OFFICER (minimum of 4 months). This Hospital (180 Beds) deals with tuberculous and non-tuberculous chest conditions and offers excellent experience in chest medicine and thoracic surgery.

Applications, stating age, sex, qualifications, nationality, and experience, together with names of 2 referees, to the Group Secretary, Cromer Area Hospital Management Committee, Cliff-avenue, Cromer, Norfolk, who will be pleased to supply any other information concerning the appointment.

HUNTINGDON COUNTY HOSPITAL. Applications are invited for the post of HOUSE OFFICER (medical). Post recognised for pre-registration purposes. The selected candidate will be required to look after medical and paediatric cases and may be called upon to give emergency anæsthetics. Post vacant beginning of October.

Apply, with full particulars and names of 2 referees, to Secretary, County Hospital, Huntingdon.

ILFORD. KING GEORGE HOSPITAL. There is a vacancy for a CLINICAL ASSISTANT in the Psychiatric Department at above Hospital. 2 sessions per week (Tuesday). Applicant must be able to carry out psychotherapy treatment and must also have had experience in child guidance. Remuneration in accordance with the terms and conditions of service of hospital medical and dental staffs (England and Wales), i.e., £175 p.a. per weekly half-day.

Applications, accompanied by testimonials, to be sent to the undersigned within 7 days of the appearance of this advertisement.

H. F. HARRIS, Group Secretary,
Ilford and Barking Group Hospital Management Committee.
King George Hospital, Ilford.

ISLE OF MAN. BALLAMONA HOSPITAL. Applications are invited for the post of SENIOR HOUSE OFFICER at the above Mental Hospital (350 Beds, admission-rate 200 annually), which undertakes all modern methods in the treatment of mental and nervous diseases as well as mental deficiency, and is recognised for training for the Conjoint D.P.M. A choice of 2 furnished flats is available. The terms and conditions of service are those of the Isle of Man Health Service, the same as those of the National Health Service. Superannuation is transferable. The Hospital may be visited by appointment.

Those interested should write for further details, and applications, stating age, nationality, qualifications and experience, together with the names of 2 referees, should be sent to the Medical Superintendent.

ISLEWORTH, MIDDLESEX. WEST MIDDLESEX HOSPITAL. (1147 Beds—General.) NORTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. PSYCHIATRIC REGISTRAR required at above Hospital. Whole-time. Non-resident. Recognised D.P.M. (England and R.M.P.A.). Candidates should have special interest in psychotherapy. Psycho-analytical training an advantage. Candidates may visit Hospital by direct appointment with Medical Director.

Application forms obtainable from, and returnable to, Group Secretary, South West Middlesex Hospital Management Committee, West Middlesex Hospital, Isleworth, by 29th September, 1956.

KETTERING GENERAL HOSPITAL, Kettering. (170 Beds.) Applications are invited from registered medical practitioners for the appointment of SENIOR HOUSE OFFICER in Anæsthetics. Post recognised for D.A.

Applications, giving details of qualifications and experience, and enclosing copies of 3 recent testimonials, to be sent to the Group Secretary, Kettering and District Hospital Management Committee, at the above address.

KNAPHILL, WOKING, SURREY. BROOKWOOD HOS-PITAL. BROOKWOOD HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the post of JUNIOR HOSPITAL MEDICAL OFFICER at above Hospital. The Hospital which is for the treatment of mental and nervous diseases, undertakes all modern methods of treatment and accommodates 1800 patients. Salary and conditions of service as laid down by Ministry of Health, viz. : £775 p.a. (providing over 2 years since registration) rising by £50 to £1075 p.a., and the National Health Service superannuation regulations apply. A charge of £170 p.a. would be made for full residential emoluments. A member of the existing medical staff is an applicant.

Applications, stating age, qualifications and experience, together with the names of 3 referees, should be sent to the Physician-Superintendent, Brookwood Hospital, Knaphill, Woking, Surrey, within 14 days of the appearance of this advertisement.

KIRKCALDY. FORTH PARK MATERNITY HOSPITAL. (54 Beds.) RESIDENT HOUSE OFFICER required for duties commencing 1st October, 1956. The post is recognised for pre-registration and as qualifying service for the D.Obst.R.C.O.G.

Apply, with testimonials or the names of 2 referees, to the Medical Superintendent, East Fife Hospitals Board of Management, 243A, High-street, Kirkcaldy.

LEAMINGTON SPA. WARNEFORD GENERAL HOS-PITAL. (197 Beds.) CASUALTY OFFICER (Senior House Officer), Male or Female, resident or non-resident. Post vacant and suitable for one reading for higher qualifications, being recognised for F.R.C.S., affording contact with all Specialist Units in the Hospital.

Applications, with names and addresses of 3 referees, to Hospital Secretary.

LEEDS (near). MENSTON (MENTAL) HOSPITAL. Applications invited for whole-time appointments (*a*) SENIOR HOUSE OFFICER, (*b*) JUNIOR HOSPITAL MEDICAL OFFICER. Facilities available for training in all branches of psychiatry in conjunction with Department of Psychiatry, Leeds University. Salaries in accordance with terms and conditions of service of hospital medical and dental staffs. Residential accommodation for single persons. No house or flat available.

Applications to Physician-Superintendent, stating age, civil state, qualifications, experience, and names and addresses of 2 referees.

LEEDS REGIONAL HOSPITAL BOARD. Senior Regis-TRAR vacancies.

Chest Diseases

Castle Hill Sanatorium, Cottingham, near Hull. (220 medical and 51 thoracic surgical beds.) Non-resident.

Child Psychiatry

Leeds University Department of Psychiatry and Associated Clinics.

Psychiatry

Scalebor Park Hospital, Burley-in-Wharfedale, near Leeds (300 Beds). 350–400 cases admitted each year to free, amenity and private beds. It is anticipated that the successful candidate will undertake 2 clinical sessions (which may include research) in association with the Department of Psychiatry of the University of Leeds. Candidates must hold the D.P.M. or equivalent qualifications.

Applications, stating age, qualifications, details of present and previous appointments with dates, together with names and addresses of 3 referees, to the Secretary, Joint Registrars Committee, Park-parade, Harrogate, by 21st September, 1956.

LEEDS. THE UNITED LEEDS HOSPITALS. The GENERAL INFIRMARY AT LEEDS. Applications are invited for the post of SENIOR REGISTRAR in General Medicine, for 1 year in the first instance. The successful candidate may be required to serve a subsequent period in 1 of the Regional Hospitals. Terms and conditions of service for hospital medical staff apply.

Applications, stating age, qualifications, previous posts with dates, and 3 names for reference, should be sent to the Sub-Dean, School of Medicine, Leeds, 2.

LEEK (near). ST. EDWARD'S HOSPITAL, Cheddleton, near LEEK, STAFFS. JUNIOR HOSPITAL MEDICAL OFFICER. Previous mental hospital experience not essential. This Hospital offers opportunities for gaining experience in all branches of psychiatry. Terms and conditions of service will be as approved for hospital medical staff employed in the National Health Service. Salary £775–£50–£1075. Single furnished quarters or unfurnished house on Hospital estate available for a married man.

Applications as soon as possible to the Medical Superintendent.

LEICESTER ROYAL INFIRMARY. Applications are invited for the posts of HOUSE SURGEON (2) available for pre-registration candidates vacant 1st October. Recognised for F.R.C.S.

Applications, stating age, and qualifications, together with copies of recent testimonials, to the Group Secretary, No. 1 Hospital Management Committee, The Leicester Royal Infirmary, forthwith.

LEICESTER ROYAL INFIRMARY. Applications are invited for the posts of SENIOR HOUSE OFFICER (pathology) (2) vacant 1st October. The posts are recognised for D.Path. and D.C.P.

Applications, stating age, qualifications, and experience, together with copies of recent testimonials, to the Group Secretary, No. 1 Hospital Management Committee, The Leicester Royal Infirmary, forthwith.

LICHFIELD. ST. MATTHEW'S HOSPITAL, Burntwood, LICHFIELD. (1350 mental beds.) BURTON-ON-TRENT HOSPITAL MANAGEMENT COMMITTEE. JUNIOR HOSPITAL MEDICAL OFFICER (psychiatry) required. Resident accommodation available. Facilities for taking a D.P.M. course at Birmingham University.

Applications, with names of 2 referees, to Medical Superintendent.

LIVERPOOL. THE UNITED LIVERPOOL HOSPITALS. ROYAL LIVERPOOL CHILDREN'S HOSPITAL. Applications are invited for appointment as CASUALTY OFFICER for the 6 months from 1st September, 1956, (or as soon thereafter as possible) to 28th February, 1957. The post is open to registered practitioners and pre-registration applicants.

Apply as soon as possible on form obtainable from the Secretary, The United Liverpool Hospitals, 80, Rodney-street, Liverpool, 1.

MANCHESTER REGIONAL HOSPITAL BOARD. South MANCHESTER HOSPITAL MANAGEMENT COMMITTEE. The Board invite applications from registered practitioners for the post of ANÆSTHETIC REGISTRAR with duties in the South Manchester Group. The post is recognised by the Royal College of Surgeons for the F.F.A.R.C.S. and for the D.A.

Applications, stating age, qualifications, present post, experience, and names of 2 referees, to be forwarded to the Group Secretary, Withington Hospital, Manchester, 20.

MANCHESTER REGIONAL HOSPITAL BOARD. BLACKBURN AND DISTRICT HOSPITAL MANAGEMENT COMMITTEE. RESIDENT REGISTRAR (obstetrics/gynæcology) required 14th November, 1956. Post recognised for M.R.C.O.G. Based on Queen's Park Hospital, Blackburn (a general hospital with 58 obstetric beds, mostly abnormal, and 29 gynæcology beds) with duties at Blackburn Royal Infirmary and Accrington Victoria Hospital.

Application forms available from, and returnable to, the Secretary, Hospital Management Committee Office, Royal Infirmary, Blackburn.

MANCHESTER REGIONAL HOSPITAL BOARD. Senior REGISTRAR in Chest Diseases with main duties at the Manchester Chest Clinic and also in the Thoracic Surgery Units at Park and Baguley Hospitals, &c.

Application forms, obtainable from the Senior Administrative Medical Officer of the Board, Cheetwood-road, Manchester, 8, should be returned by 24th September, 1956.

MANCHESTER REGIONAL HOSPITAL BOARD. SALFORD HOSPITAL MANAGEMENT COMMITTEE. Applications invited for post of NON-RESIDENT REGISTRAR to the Neurosurgical Department at Salford Royal and the Royal Manchester Children's Hospitals. In addition to adult work, the post offers exceptional opportunities for experience in pædiatric neurosurgery.

Applications, together with names and addresses of 2 referees, to be sent to Group Secretary, Salford Royal Hospital, Salford, 3, not later than 7 days from the appearance of this advertisement.

MANCHESTER REGIONAL HOSPITAL BOARD invites applications for the post of REGISTRAR in Pathology. The duties will be with the Stockport and Buxton Hospital Management Committee and the successful candidate will work under the direction of the Consultant Group Pathologist. The post is recognised for the Diploma in Pathology.

Applications, stating age, experience, and qualifications, together with copies of 2 testimonials, to be addressed to the Group Secretary, Stockport and Buxton Hospital Management Committee, 59B, Shaw-heath, Stockport, Cheshire.

MANCHESTER REGIONAL HOSPITAL BOARD invites applications for the post of Whole-time RESIDENT SURGICAL REGISTRAR to the West Manchester Hospital Management Committee with duties primarily at Park Hospital, Davyhulme, but with duties at other hospitals within the Group. Post vacant early September. 12 months appointment subject to renewal.

Form from Secretary, Park Hospital, Davyhulme.

MANCHESTER REGIONAL HOSPITAL BOARD invites applications for the post of REGISTRAR in Anæsthetics. The main duties will be with the Stockport and Buxton Hospital Management Committee, with some duties in the Macclesfield and District Hospital Management Committee Group. The post is recognised for the D.A. and F.F.A.R.C.S., and would suit a candidate wishing to study for higher qualification.

Applications, stating age, qualifications, and experience, together with copies of 2 testimonials, to be addressed to the Secretary, Stockport and Buxton Hospital Management Committee, 59B, Shaw-heath, Stockport.

MANCHESTER REGIONAL HOSPITAL BOARD. Applications invited for post of NON-RESIDENT REGISTRAR in E.N.T. Surgery to the Salford and West Manchester Groups of hospitals, with main duties at Salford Royal and Park Hospitals.

Applications, together with names and addresses of 2 referees, to be sent to Group Secretary, Salford Hospital Management Committee, Salford Royal Hospital, Salford, 3, not later than 7 days from the appearance of this advertisement.

MANCHESTER. WEST MANCHESTER HOSPITAL MANAGEMENT COMMITTEE. PARK HOSPITAL, DAVYHULME. (General Hospital—433 Beds.)

HOUSE OFFICER (general medicine) required. Pre-registration. Post vacant middle October.

HOUSE OFFICER (obstetrics) required. Pre-registration. Post recognised for M.R.C.O.G. examination. Post vacant middle October.

3 HOUSE OFFICERS (general surgery) required. Pre-registration. Posts recognised for F.R.C.S. examination. Vacant mid-October, end-October, mid-November respectively.

Application forms from Secretary.

MANCHESTER. UNITED MANCHESTER HOSPITALS. SAINT MARY'S HOSPITALS, MANCHESTER. Applications are invited for the post of OBSTETRICAL HOUSE SURGEON to a maternity unit operating temporarily in the Whitworth Park Branch of the above-named Hospital, vacant shortly. The post is supernumerary to the establishment recognised for training purposes by the Royal College of Obstetricians and Gynæcologists. Previous obstetrical experience is desirable. An opportunity exists for a limited amount of gynæcological training during tenure of the post. National scale.

Application forms, which may be obtained from the undersigned, to be returned no later than 15th September, 1956.

A. R. WISE, General Superintendent.

Saint Mary's Hospitals, Whitworth Park, Manchester, 13.

MANCHESTER. UNITED MANCHESTER HOSPITALS. MANCHESTER ROYAL INFIRMARY, MANCHESTER, 13. REGISTRAR to the Department of Cardiology, to commence on 4th January, 1957. Whole-time non-resident post, tenable for 1 year, renewable for a further year.

Application form obtainable from the undersigned, to be returned not later than 15th September, 1956.

G. H. TAYLOR, Secretary.

MANCHESTER. BOOTH HALL AND MONSALL HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER (pathology) resident, required to assist the Director of Pathology for the Group (Booth Hall Children's Hospital and Monsall Hospital). Salary £745 p.a., less £140 p.a. for residence. Post tenable for 1 year in the first instance.

Applications to be sent as soon as possible to the Group Secretary, Booth Hall Hospital, Manchester, 9.

MANCHESTER. BOOTH HALL CHILDREN'S HOSPITAL, BLACKLEY, MANCHESTER, 9. (380 Beds. Recognised for D.C.H.) HOUSE OFFICER (surgical), pre- or post-registration. Duties mainly general surgery and E.N.T. Post now vacant.

Applications, with usual particulars and copies of 2 recent testimonials, to the Group Secretary.

MANCHESTER, 8. CRUMPSALL HOSPITAL. Applications are invited from registered or pre-registered practitioners for the post of HOUSE SURGEON in the Department of Obstetrics. Recognised for M.R.C.O.G. Vacant 1st November, 1956.

Applications, with names of 2 referees, by 17th September, 1956, to Group Secretary, North Manchester Hospital Management Committee, Crumpsall Hospital, Manchester, 8.

MANCHESTER (near). ALTRINCHAM GENERAL HOSPITAL. ASSISTANT SENIOR SURGICAL OFFICER (Junior Hospital Medical Officer grade). Applications are invited for this post in a hospital of 130 acute beds with a busy Casualty Department. The appointee would be required to exercise control of this Department and also to assist Resident Surgical Officer with the general surgical work of the Hospital. The post offers excellent opportunities of practical experience and postgraduate study to suitably qualified candidates and particularly those studying for higher surgical qualifications.

Applications, with names of 2 referees, to Group Secretary, North and Mid-Cheshire Hospital Management Committee, Sinderland-road, Altrincham.

MANCHESTER (near). ALTRINCHAM GENERAL HOSPITAL AND ANNEXE. (130 Beds.) Applications are invited for the pre-registration post of JUNIOR HOUSE OFFICER (surgical). Post vacant October.

Applications to Group Secretary, North and Mid-Cheshire Hospital Management Committee, The Hospital, Sinderland-road, Altrincham, Cheshire.

MAIDENHEAD HOSPITAL, Berkshire. Applications invited from registered practitioners for post of HOUSE PHYSICIAN, vacant 22nd September.

Applications, stating age, qualifications, experience and nationality, with names of 3 referees, to Secretary.

MEXBOROUGH. MONTAGU HOSPITAL (168 Beds), AND SANDYGATE HOUSE ANNEXE (30 Beds). Locum SENIOR HOUSE OFFICER (casualty and orthopædics) required from 16th September, 1956. Residential emoluments £150 p.a.

Applications to the Secretary, Hospital Management Committee, "Fern Bank," Doncaster-road, Rotherham.

MEXBOROUGH. MONTAGU HOSPITAL. (168 Beds. Recognised for training for F.R.C.S. examination.) SHEFFIELD REGIONAL HOSPITAL BOARD. Whole-time RESIDENT SURGICAL REGISTRAR required. Appointment for 1 year in first instance.

Apply to Secretary, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield, by 17th September, 1956, giving age, nationality, qualifications, present and previous appointments with dates, naming 3 referees.

NORTHAMPTON GENERAL HOSPITAL. (482 Beds.) Vacancies 1st October, 1956, for the following :—

HOUSE OFFICER (general surgery) ; recognised for F.R.C.S.
HOUSE OFFICER (Department of Anæsthetics) ; recognised for D.A.
HOUSE OFFICER (Pædiatric Department) ; recognised for D.C.H.
HOUSE OFFICER (Fracture and Orthopædic Department) ; recognised for F.R.C.S.
HOUSE OFFICER (Casualty Department) ; recognised for F.R.C.S.
SENIOR HOUSE OFFICER (Casualty Department) ; recognised for F.R.C.S.
SENIOR HOUSE OFFICER (E.N.T. Department); recognised for F.R.C.S. and D.L.O.
SENIOR HOUSE OFFICER (Department of Pathology).

All posts, except those of Anæsthetic House Officer and the Senior House Officer posts, recognised for pre-registration. Casualty House Officer and Pædiatric House Officer posts recognised for medical pre-registration. All 6 months appointments in first instance.

Applications, enclosing copies of 3 testimonials, as soon as possible, to S. G. HILL, Superintendent.

NOTTINGHAM GENERAL HOSPITAL. Applications are invited from registered medical practitioners for the post of SENIOR HOUSE OFFICER (casualty) duties to commence on or about 7th September, 1956. Establishment 3. Recognised for F.R.C.S. Post offers wide experience of casualty work.

Applications, stating age, nationality, qualifications and experience, together with copies of testimonials, to be sent to the Secretary, General Hospital, Nottingham.

NOTTINGHAM. HIGHBURY HOSPITAL. Senior HOUSE OFFICER (surgical) required at the above Hospital. Good opportunity for obtaining experience in all types of general surgery. Duties to commence on or about 16th September, 1956.

Applications, stating age, qualifications and experience, and nationality, together with copies of testimonials, to be sent to the Group Secretary, General Hospital, Nottingham.

NUNEATON. MANOR HOSPITAL. (125 Beds.) Receiving ROOM OFFICER for casualty duties. Resident, furnished flat available. Junior Hospital Medical Officer status. Recognised F.R.C.S.

Applications to Hospital Secretary.

NUNEATON. MANOR HOSPITAL. (125 Beds.) House OFFICER (pre-registration), General Surgery. Recognised F.R.C.S. Resident.

Applications to Hospital Secretary.

NUNEATON. MANOR HOSPITAL. (125 Beds.) House OFFICER (orthopædic and general surgery), pre-registration (60 Beds). Resident.

Applications to Hospital Secretary.

NEWCASTLE GENERAL HOSPITAL. Newcastle upon TYNE HOSPITAL MANAGEMENT COMMITTEE. DEPARTMENT OF NEUROLOGICAL SURGERY. The post of SENIOR HOUSE OFFICER (either resident or non-resident), becomes vacant on 24th September, 1956. The appointment is tenable for 12 months in the first instance.

Applications should be addressed to the Secretary, Newcastle General Hospital, Westgate-road, Newcastle upon Tyne, together with names and addresses of 2 referees.

NEWCASTLE REGIONAL HOSPITAL BOARD. NEWCASTLE UPON TYNE HOSPITAL MANAGEMENT COMMITTEE. REGISTRAR PHYSICIAN (whole-time, 1 year only), for Cardiovascular Unit, Newcastle General Hospital. Single accommodation available.

Applications, with names and addresses of 3 referees, to Senior Administrative Medical Officer, Newcastle Regional Hospital Board, Benfield-road, Newcastle upon Tyne, 6, within 7 days.

NEWCASTLE REGIONAL HOSPITAL BOARD. Tees-SIDE HOSPITAL MANAGEMENT COMMITTEE. REGISTRAR OPHTHALMOLOGIST (whole-time), at North Riding Infirmary. Post recognised for D.O. examination. Single accommodation available.

Applications, with names and addresses of 3 referees, to Senior Administrative Medical Officer, Newcastle Regional Hospital Board, Benfield-road, Newcastle upon Tyne, 6, within 7 days.

NEWCASTLE REGIONAL HOSPITAL BOARD. Gates-HEAD HOSPITAL MANAGEMENT COMMITTEE. (Approximately 120 orthopædic beds in the Group.) REGISTRAR ORTHOPÆDIC SURGEON (whole-time). Single accommodation available.

Applications, with names and addresses of 3 referees, to Senior Administrative Medical Officer, Newcastle Regional Hospital Board, Benfield-road, Newcastle upon Tyne, 6, within 7 days.

NEWMARKET GENERAL HOSPITAL, Suffolk. Applications are invited for the post, now vacant, of SENIOR HOUSE OFFICER, for orthopædic and casualty duties. The post is resident.

Applications, giving age, nationality and qualifications, together with 3 recent testimonials, should be sent to the Medical Superintendent.

OXFORD. UNITED OXFORD HOSPITALS. Applications are invited for the post of HOUSE SURGEON in the Thoracic Surgery Unit at the Churchill Hospital, to commence as early as possible until 31st January, 1957.

Applications, stating age, qualifications and experience, together with names of 2 referees, to Administrative Assistant, Radcliffe Infirmary, Oxford.

PLYMOUTH. SOUTH DEVON AND EAST CORNWALL HOSPITAL.

HOUSE SURGEON (pre-registration post), vacant 1st December, 1956. Recognised for the F.R.C.S. Devonport Section.

HOUSE SURGEON (pre-registration post), vacant 1st December, 1956. Recognised for the F.R.C.S. Greenbank Road Section.

Applications, stating age, nationality, qualifications and experience, together with the names and addresses of 3 referees, to be sent to—

ARTHUR R. CASH, Group Secretary, Plymouth,
South Devon and East Cornwall General Hospital Group.
7, Nelson-gardens, Stoke, Plymouth.

POOLE GENERAL HOSPITAL, Longfleet-road, Poole, DORSET. BOURNEMOUTH AND EAST DORSET HOSPITAL MANAGEMENT COMMITTEE. CASUALTY OFFICER (Senior House Officer) required immediately. Resident or non-resident. Hours of duty 9 A.M.–6 P.M. Post suitable for person reading for higher diplomas.

Applications, with copies of 2 recent testimonials, to the Hospital Secretary.

PORTSMOUTH GROUP HOSPITAL MANAGEMENT COMMITTEE.

(1) **Queen Alexandra Hospital**

(*a*) SENIOR HOUSE SURGEON (87 surgical beds), vacant now.

(*b*) HOUSE PHYSICIAN (Locum). Not necessarily fully registered. Vacant now.

(2) **Royal Portsmouth Hospital**

(*a*) SENIOR HOUSE SURGEON (70 surgical beds), vacant 19th September, 1956.

(*b*) ANÆSTHETIST (Senior House Officer grade). Recognised for the F.F.A.R.C.S. Vacant 1st October, 1956.

Applications, stating age, experience and qualifications, together with the names of 2 referees, should be forwarded as soon as possible to E. H. HURST.
St. Mary's Hospital, Milton-road, Portsmouth.

READING AND DISTRICT HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the appointment of JUNIOR HOSPITAL MEDICAL OFFICER in the Area Department of Diseases of the Chest, for duty in the Reading Chest Clinic. The post offers wide experience in both tuberculous and non-tuberculous chest diseases and duties will include attendance at Prospect Park Hospital, Reading, and Peppard Chest Hospital, Henley. Facilities are available for postgraduate studies. Salary within the scale £775–£1075 p.a.

Applications, stating age and qualifications, together with names of 3 referees, should be sent to the Group Secretary, 3, Craven-road, Reading.

READING. BATTLE HOSPITAL. (391 Beds.) Applications are invited from registered medical practitioners for the post of RESIDENT JUNIOR HOUSE SURGEON in the Area Accident and Orthopædic Department. Post vacant 1st October next. F.R.C.S. recognised. Also casualty duties. Salary £425–£525 p.a., less £125 board-residence.

Apply, stating age, qualifications with dates, nationality, present post, with 1 copy of recent testimonial, to Hospital Secretary.

READING COMBINED HOSPITALS. Area Department OF OBSTETRICS AND GYNÆCOLOGY. (104 Beds.) Applications are invited from registered medical practitioners, Male and Female, for the resident appointment of GYNÆCOLOGICAL HOUSE SURGEON at the Royal Berkshire Hospital, Reading. Vacant 1st October and tenable for 6 months. Post recognised for M.R.C.O.G.

Write, stating age and qualifications with dates, nationality, and present appointment, with copy of 1 recent testimonial, to Secretary.

REDHILL. EAST SURREY HOSPITAL, Shrewsbury-road, REDHILL. RESIDENT HOUSE SURGEON (pre-registration appointment), vacant late September.

Apply Hospital Secretary, naming 2 referees.

ROMFORD, ESSEX. VICTORIA HOSPITAL. (99 Beds.) RESIDENT HOUSE PHYSICIAN (Male) required early in September, 1956. Post not approved for pre-registration purposes.

Applications should be forwarded to the Secretary, Romford Group Hospital Management Committee, Oldchurch Hospital, Romford.

RUGBY. HOSPITAL OF ST. CROSS. (168 Beds.) HOUSE OFFICER (pre-registration), General Surgery. Recognised F.R.C.S. Resident.

Applications to Hospital Secretary.

SALISBURY GENERAL HOSPITAL. Orthopædic Depart-MENT. Applications are invited for the post of SENIOR HOUSE OFFICER (resident) or RESIDENT HOUSE SURGEON which is also recognised for pre-registration candidates. The Department has over 50 Beds and a large outpatient turnover, dealing with fractures and all types of orthopædic surgery.

Applications, stating age, nationality, qualifications and experience, and naming 2 referees, to the Group Secretary, Salisbury Group Hospital Management Committee, Odstock Hospital, Salisbury, as soon as possible.

SALISBURY GROUP HOSPITAL MANAGEMENT COM-MITTEE. REGIONAL PLASTIC AND ORAL SURGERY CENTRE, ODSTOCK HOSPITAL, SALISBURY, WILTS. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for the post of SURGICAL REGISTRAR. Candidates should have had wide surgical experience and the possession of a higher surgical degree will be an advantage. Post vacant 16th November, 1956.

Application forms may be obtained from, and must be returned to, the Group Secretary, Odstock Hospital, Salisbury.

SKIPTON (near). GRASSINGTON HOSPITAL. (208 Beds.) JUNIOR HOSPITAL MEDICAL OFFICER required for the above Hospital, which provides treatment for tuberculosis patients, men and women. Accommodation available for single applicants. Post tenable from 1st September, 1956.

Applications to Medical Superintendent.

SCOTLAND. SOUTH-EASTERN REGIONAL HOS-PITAL BOARD. Applications are invited for the appointment of a SENIOR REGISTRAR at Stratheden Mental Hospital, Cupar, Fife. During the tenure of the post opportunities for interchange of duty and training at other centres in the Region may be available under joint arrangements between the South-Eastern Regional Hospital Board and the Department of Psychological Medicine of the University of Edinburgh. Applicants must hold a Diploma in Psychological Medicine or a higher qualification in medicine. A flat is available.

Applications, giving particulars of age, qualifications, and previous experience, together with the names of 3 referees, should be sent to the Secretary, South-Eastern Regional Hospital Board, 11, Drumsheugh-gardens, Edinburgh, 3, by 29th September.

SCOTLAND. WESTERN REGIONAL HOSPITAL BOARD. Applications are invited for the appointment of SENIOR REGISTRAR in Pathology with primary duties in haematology and blood-transfusion, based at Stobhill General Hospital, Glasgow, which will be for 1 year in the first instance. This appointment is subject to the National Health Service (Scotland) superannuation regulations.

Applications (12 copies), stating date of birth, qualifications, experience, present appointment, and the names of 3 referees, to reach the Secretary, Western Regional Hospital Board, 64, West Regent-street, Glasgow, C.2, by 22nd September, 1956.

SCOTLAND. EASTERN REGIONAL HOSPITAL BOARD. PSYCHIATRIC UNIT, MARYFIELD GENERAL HOSPITAL AND DUNDEE ROYAL MENTAL HOSPITAL. Applications are invited for the post of SENIOR REGISTRAR. These active units (including a new E.E.G. Department) and their associated Outpatient Department are principally concerned with the treatment of neuroses and early psychoses and provide a comprehensive training in psychiatry. Candidates, in addition to psychiatric experience, must possess up-to-date knowledge of internal medicine. Salary and conditions of service in accordance with national agreement.

Further particulars and forms of application from the Secretary of the Board, 430, Blackness-road, Dundee, with whom applications must be lodged not later than 15th September, 1956.

SCOTLAND. EASTERN REGIONAL HOSPITAL BOARD. ASHLUDIE HOSPITAL, MONIFIETH, DUNDEE. Thoracic surgery. Applications are invited for the appointment of SENIOR REGISTRAR in Thoracic Surgery at Ashludie Hospital, Monifieth, near Dundee (222 Beds), which contains the Regional Thoracic Surgical Unit of 66 Beds for tuberculous and non-tuberculous cases. Higher surgical qualification and previous experience in thoracic surgery essential; additional experience in general or chest medicine an advantage. Salary and conditions of service in accordance with national agreement.

Forms of application and further particulars from the Secretary to the Board, 430, Blackness-road, Dundee, with whom applications must be lodged not later than 15th September, 1956.

SCOTLAND. EASTERN REGIONAL HOSPITAL BOARD. PSYCHIATRIC UNIT, MARYFIELD GENERAL HOSPITAL AND DUNDEE ROYAL MENTAL HOSPITAL. Applications are invited for the post of REGISTRAR. These active Units (including a new E.E.G. Department) and their associated Outpatient Department are principally concerned with the treatment of neuroses and early psychoses and provide a comprehensive training in psychiatry. Candidates must possess, in addition to psychiatric experience, up-to-date knowledge of internal medicine. Salary and conditions of service in accordance with national agreement.

Further particulars and form of application from the Secretary of the Board, 430, Blackness-road, Dundee, with whom applications must be lodged not later than 22nd September, 1956.

SCUNTHORPE. WAR MEMORIAL HOSPITAL. (262 Beds.) Applications are invited for RESIDENT HOUSE PHYSICIANS.

(*a*) Senior House Officer/Intern, vacant late September.

(*b*) Intern/Senior House Officer, vacant early October.

Busy department with medicine, paediatrics, skins and eyes—large outpatient clinics.

Applications, naming 2 referees, to Group Secretary, Scunthorpe Hospital Management Committee.

SHEFFIELD. CITY GENERAL HOSPITAL. Applications are invited for the resident appointment of HOUSE SURGEON (general surgery). Recognised pre-registration post. Vacant 29th October, 1956.

Apply, giving full details of age, nationality, qualifications, present and previous appointments if any, and the names of 2 persons for reference, to the Group Secretary at Nether Edge Hospital, Sheffield, 11.

SHEFFIELD REGIONAL HOSPITAL BOARD. Whole-time SENIOR REGISTRAR in Psychiatry required for Middlewood Hospital, Sheffield (2098 Beds). A flat (2 bedrooms) is available. D.P.M. essential. Appointment for 1 year in the first instance, reviewable annually. Opportunity for research and experience in the special branches of psychiatry available in the Hospital area.

Application forms and further details obtained from Senior Administrative Medical Officer, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield. Forms to be returned by 17th September, 1956.

SHEFFIELD REGIONAL HOSPITAL BOARD. Sheffield NATIONAL CENTRE FOR RADIOTHERAPY. Whole-time NON-RESIDENT SENIOR REGISTRAR required. Candidates should possess the Diploma in Radiotherapy or a higher qualification in medicine or surgery. Duties mainly in Sheffield but there may be occasional duties at associated centres in the region. Appointment for 1 year in first instance reviewable annually.

Apply to Secretary, Sheffield Regional Hospital Board, Old Fulwood-road, Sheffield, by 17th September, 1956, giving age, nationality, qualifications, present and previous appointments with dates, naming 3 referees.

SHEFFIELD. THE UNITED SHEFFIELD HOSPITALS. ROYAL INFIRMARY UNIT. Applications are invited for the following posts at the above Hospital :—

(*a*) NON-RESIDENT REGISTRAR in Ophthalmology. Closing date for applications, 22nd September, 1956.

(*b*) RESIDENT SENIOR HOUSE OFFICER in Clinical Pathology. Post vacant 3rd October, 1956. Pathological experience not essential. The successful candidate will work in turn in the different branches of clinical pathology in the laboratories of The United Sheffield Hospitals.

Applications for the above posts should give the names of 3 referees and be sent to :—

For post (*a*) : The Chief Administrative Officer, The United Sheffield Hospitals, West-street, Sheffield, 1.

For post (*b*) : The Superintendent, Royal Infirmary, Sheffield, 6.

SHOTLEY BRIDGE GENERAL HOSPITAL, Shotley BRIDGE, CO. DURHAM. (557 Beds.) NORTH WEST DURHAM HOSPITAL MANAGEMENT COMMITTEE. Applications are invited for the resident post of HOUSE SURGEON, which is recognised for pre-registration purposes. Salary £425–£525 p.a. according to experience. Deduction of £125 p.a. for board, lodging, &c. 6 months appointment. Post recognised for F.R.C.S.

Applications, stating age, qualifications, experience, and enclosing copies of 2 recent testimonials, to the Group Secretary.

SLOUGH, BUCKINGHAMSHIRE. UPTON HOSPITAL. WINDSOR GROUP HOSPITAL MANAGEMENT COMMITTEE. Locum HOUSE OFFICER (casualty) required. Experience provided in orthopaedics and plastic cases.

Applications, stating age and qualifications, with names of 2 referees, to Secretary.

SLOUGH, BUCKINGHAMSHIRE. UPTON HOSPITAL. Locum CASUALTY REGISTRAR required for 6 weeks from 16th September. Junior Casualty Officer employed.

Applications, with names of 2 referees, to Secretary.

STAFFORD HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER (anaesthetics), Male or Female, resident. Recognised for D.A.

Applications to Group Secretary, Stafford Hospital Management Committee, 13, Foregate-street, Stafford.

SOUTH EAST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for an appointment as Whole-time REGISTRAR in E.N.T. Surgery to fill a vacancy in the approved trainee establishment at the South-East Kent Group of hospitals. The appointment will be in accordance with the terms and conditions of service of hospital medical and dental staffs (England and Wales), and will be for 1 year in the first instance.

Applications, giving particulars of age, qualifications and experience with relevant dates, together with the names and addresses of 2 referees, to be sent to the Secretary, Registrars Committee, 11, Portland-place, W.1, not later than 22nd September, 1956.

SOUTH CHESHIRE HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER (anaesthetics). 6 months or 12 months as preferred. Approved for D.A. Duties chiefly at general hospital and maternity unit. Salary and conditions as per regulations.

Applications, stating age, details of experience, qualifications and names of 3 referees, immediately, to Group Secretary, Group Headquarters, Barony Hospital, Nantwich, Cheshire.

SOUTHAMPTON. ROYAL SOUTH HANTS HOSPITAL. (278 Beds.) ORTHOPÆDIC HOUSE SURGEON required. Post recognised for Pre-registration Service and tenable for 6 months. The Hospital is the centre to which all trauma from a large industrial town and port is directed thus providing excellent experience in the treatment of traumatic conditions ; patients with orthopædic conditions are also drawn from a wide area.

Applications, with copies of testimonials, should be sent as soon as possible to the Group Secretary, Southampton Group Hospital Management Committee, Bullar-street, Southampton.

SOUTHAMPTON. ROYAL SOUTH HANTS HOSPITAL (274 Beds) and SOUTHAMPTON GENERAL HOSPITAL (472 Beds). SENIOR HOUSE OFFICER (E.N.T.) required beginning of October. This post is recognised for the F.R.C.S (Eng.) and D.L.O. examinations and provides experience in all branches of E.N.T. work. The Group includes a diagnostic and distributing Hearing Aid Centre.

Applications, with copies of recent testimonials, should be forwarded as soon as possible, to the Secretary, Southampton Group Hospital Management Committee, Bullar-street, Southampton.

STOCKTON-ON-TEES. SEDGEFIELD GENERAL HOSPITAL, SEDGEFIELD. (336 Beds.) SEDGEFIELD HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER ANÆSTHETIST urgently required. Full Consultant staff employed, and the post, which offers excellent facilities for anæsthetic training, is recognised for the higher qualifications. Furnished Bungalow available at very moderate rental.

Applications, together with 2 testimonials or names of 2 referees, to the undersigned as soon as possible.

L. WATSON, Group Secretary.

STOKE-ON-TRENT. CITY GENERAL HOSPITAL. (845 Beds. Recognised for F.F.A.R.C.S. and D.A.) STOKE-ON-TRENT HOSPITAL MANAGEMENT COMMITTEE. SENIOR HOUSE OFFICER in Anæsthetics. Post vacant 1st October, 1956. Previous anæsthetic experience desirable but not essential. The post offers experience in anæsthesia for all types of general surgery, thoracic and cardiac surgery, including an Obstetric Unit of 60 Beds. Staff includes a Senior Registrar who shares in emergency duties.

Applications, with necessary details and copy testimonials, to the Group Secretary, Stoke-on-Trent Hospital Management Committee, Princes-road, Stoke-on-Trent.

STOKE-ON-TRENT. NORTH STAFFORDSHIRE ROYAL INFIRMARY. HOUSE OFFICER (general surgery) required. Pre-registration post. Hospital recognised for F.R.C.S.

Detailed applications, with copy testimonials, to Group Secretary, Hospital Management Committee, Princes-road, Stoke-on-Trent.

SUNDERLAND. ROYAL INFIRMARY. (300 Beds.) HOUSE OFFICER (Male) required for duties in Gynæcological and Urological Units. Post vacant 26th September, 1956. Provisionally registered practitioners may apply.

Applications, naming 2 referees, to the Hospital Secretary, Royal Infirmary, Sunderland.

SUTTON. BELMONT HOSPITAL. St. Ebba's and BELMONT GROUP HOSPITAL MANAGEMENT COMMITTEE. SOUTH WEST METROPOLITAN REGIONAL HOSPITAL BOARD. Applications are invited for appointment as PSYCHIATRIC REGISTRAR at above Hospital, which is principally concerned with the treatment of neuroses and the early psychoses. There are ample opportunities for research and the Hospital, which is recognised for the D.P.M., takes an active part in teaching in association with teaching hospitals. The vacancy is in the Social Rehabilitation Unit which is concerned primarily with treatment on group community and family lines. Candidates may visit the Hospital by appointment with the Physician-Superintendent.

Application forms may be obtained from the Group Secretary, Group Office, Belmont Hospital, Brighton-road, Sutton, Surrey, and completed forms (5 copies) should be returned to him within 2 weeks of the appearance of this advertisement.

SWINDON AND DISTRICT HOSPITAL MANAGEMENT COMMITTEE. Applications invited for the appointment of SENIOR HOUSE OFFICER as Casualty Officer and Orthopædic House Surgeon at Great Western Hospital, Swindon. Post recognised by R.C.S. for 6 months of years training under Fellowship regulations. Work of Accident and Orthopædic Department, associated with Nuffield Orthopædic Centre (Wingfield Morris Orthopædic Hospital), Oxford, includes large number of industrial injuries. Salary £745 p.a., less £150 p.a. for residential emoluments.

Full details and names of 3 referees, to Secretary, 7, Okus-road, Swindon, Wilts, by 20th September.

TAPLOW, near MAIDENHEAD. CANADIAN RED CROSS MEMORIAL HOSPITAL. Applications invited for post of HOUSE PHYSICIAN to the Special Unit for research in Juvenile Rheumatism, vacant 6th October. Post offers scope for those interested in research, paediatrics, rheumatology, or cardiology.

Applications, stating age, qualifications and experience, with copies of 2 testimonials, to Secretary.

TAPLOW, near MAIDENHEAD. CANADIAN RED CROSS MEMORIAL HOSPITAL. HOUSE PHYSICIAN required for post vacant 12th October. Preference given to persons seeking pre-registration post.

Applications, stating age, experience, and qualifications with dates, with copies of 2 testimonials, to Secretary.

TORQUAY. TORBAY HOSPITAL. Resident Senior HOUSE OFFICER (surgery) required early September, 1956. Post recognised for F.R.C.S. There is a complement of 6 Resident House Officers.

Applications, stating qualifications, age, nationality, with copies of testimonials (quoting Ref. F. 955/72) to the Group Secretary, Torquay District Hospital Management Committee, Torbay Hospital, Torquay, S. Devon.

WAKEFIELD. PINDERFIELDS GENERAL HOSPITAL. RESIDENT SURGICAL OFFICER (Senior House Officer grade) required from 1st November, 1956. Recognition of post for Royal College of Surgeons applied for. Salary £745 p.a. A charge of £150 p.a. will be made for accommodation.

Address written applications, giving full personal particulars and details of experience, &c., to W. BOWRING, Group Secretary. Victoria Chambers, Wood-street, Wakefield.

WAKEFIELD. PINDERFIELDS GENERAL HOSPITAL. Locum Tenens RESIDENT SURGICAL OFFICER (Senior House Officer grade) required from 1st September, 1956. Salary £14 10s. per week. A charge at the rate of £150 p.a. will be made for accommodation.

Address written applications, giving full personal particulars and details of experience, &c., to W. BOWRING, Group Secretary. Victoria Chambers, Wood-street, Wakefield.

WALLINGFORD (near), BERKSHIRE. FAIR MILE HOSPITAL. BERKSHIRE MENTAL HOSPITALS MANAGEMENT COMMITTEE. Applications are invited for the appointment of JUNIOR HOSPITAL MEDICAL OFFICER at above Mental Hospital of 1053 Beds. The post provides an excellent opportunity for postgraduate training in psychiatry, including outpatient clinic work and every facility is provided for study for the D.P.M. Single residential accommodation is available. The appointment is subject to the terms and conditions of service for hospital medical staff, the salary scale being £775–£50–£1075 p.a.

Applications, including details of age, qualifications and experience, together with the names of 2 referees, should be forwarded to the Medical Superintendent, Fair Mile Hospital, near Wallingford, Berks., within 10 days of the appearance of this advertisement.

WELSH REGIONAL HOSPITAL BOARD. Senior REGISTRAR in Thoracic Medicine at Sully Hospital, near Penarth. Regional Thoracic Centre (324 Beds). Previous experience in cardiology desirable. Resident or non-resident. Married accommodation available.

Application forms from Senior Administrative Medical Officer, Temple of Peace, Cathays Park, Cardiff, within 14 days.

WEYMOUTH AND DISTRICT HOSPITAL. (124 Beds.) HOUSE PHYSICIAN (Male or Female) required for resident, pre-registration post; vacant end September and tenable for 6 months.

Applications, stating age, qualifications, and nationality, together with 2 copy testimonials, to Group Secretary, West Dorset Hospital Management Committee, Damers-road, Dorchester, Dorset, immediately.

WILLERBY, EAST YORKSHIRE (near Hull). DE LA POLE HOSPITAL. (1174 Beds—mental illness and nervous disorders.) JUNIOR HOSPITAL MEDICAL OFFICER. Hospital has admission-rate of over 850 annually. Modern reception hospital, villas and neurosis unit. All modern methods of treatment practised. The successful candidate will be engaged on work in the admission wards to a considerable extent and for duties at a Psychiatric Day Clinic to be opened shortly. Accepted for D.P.M. training. Residential.

Application forms from Group Secretary, Hull B Hospital Management Committee, at the above address.

WOODFORD GREEN, ESSEX. HARTS HOSPITAL. (100 Beds.) SENIOR HOUSE OFFICER required. Post vacant 4th October, 1956. The Hospital is a modern sanatorium with a Thoracic Surgical Unit and Area Chest Clinic. The post offers exceptional opportunity for gaining experience in tuberculosis and diseases of the chest. Accommodation for single person only. Salary £745 p.a., less £150 p.a. for board, lodging, &c.

Applications, with copies of 2 recent testimonials, should be sent immediately to Secretary, Forest Group Hospital Management Committee, Langthorne-road, E.11.

YORK. COUNTY, CITY AND YEARSLEY BRIDGE HOSPITALS. Locum Tenens SENIOR HOUSE OFFICER in Paediatrics and Infectious Diseases required 17th–30th September, 1956.

Applications, giving age, nationality, qualifications and names of 2 referees, to Group Secretary, York A and Tadcaster Hospital Management Committee, Bootham Park, York, immediately.

Public Appointments

AMENDED CLOSING DATE

MINISTRY OF SUPPLY. Deputy Chief Scientific Officer. The Civil Service Commissioners invite applications from men aged 32 or more on 1st September, 1956, for the pensionable post of SUPERINTENDENT OF MEDICAL DIVISION, Chemical Defence Experimental Establishment, Porton, Wilts. The Superintendent of the Division would be responsible for groups carrying out pure and applied research in physiology, pharmacology, toxicology, biophysics and biochemistry. Candidates must be medically qualified. In addition a first or second class honours degree in physiology or other natural science would be an advantage. Experience of medical research including toxicological techniques essential. Salary scale £2300–£2600. Starting salary above minimum may be granted according to qualifications and experience.

Further particulars and application forms from Civil Service Commission, Scientific Branch, 30, Old Burlington-street, London, W.1, quoting No. S.4618/56/8. The closing date for the receipt of application has been extended to 25th October, 1956.

BIRMINGHAM. CITY OF BIRMINGHAM. Public HEALTH DEPARTMENT. Applications invited from registered medical practitioners for post of ASSISTANT ADMINISTRATIVE MEDICAL OFFICER OF HEALTH (Male or Female). Candidates should hold the Diploma of Public Health. The successful candidate will have an opportunity to gain administrative experience in all branches of the Public Health Service, including maternity and child welfare. Salary scale £1405–£55–£1625 p.a. Commencing salary within the scale will depend upon the Medical Officer's experience. Pension scheme (including Widows and Orphans); medical examination. The Officer appointed will be required to devote his/her whole time to official duties and the appointment will be subject to 3 months notice on either side.

Applications, with the names of 3 persons to whom reference may be made, to be sent to the Medical Officer of Health, Council House, Birmingham, 3, not later than 24th September, 1956.

DUBLIN. CORPORATION OF DUBLIN. Vacancy for Temporary BACTERIOLOGICAL REGISTRAR. Salary: £862 10s. 0d. p.a. inclusive.

Application forms and full particulars from Establishment Department, City Hall, Dublin. Latest date for receipt of applications 21st September, 1956.

JOHN P. KEANE, City Manager and Town Clerk.

City Hall, Dublin, 22nd August, 1956.

GOVERNMENT OF BRITISH GUIANA. Pathologist required for the New Amsterdam and the Mental Hospitals, to have charge of Laboratory staff, buildings and equipment; to supervise laboratories of Government Hospitals; and be responsible for training of laboratory Technicians. Candidates must hold medical qualifications registrable in the United Kingdom and Diploma in Pathology or Bacteriology. Appointment on permanent basis with pension (non-contributory) 1/600th of final pensionable emoluments for each completed month of service, or on contract for 3 years resident service with gratuity taxable of 22½% of salary for each 3 months service. Candidates in the National Health Service may retain their superannuation rights during their service abroad (up to 6 years) and receive a gratuity (taxable) of 20% of the aggregate of their salary on leaving oversea employment. Salary £1600 a year plus non-pensionable allowance of £250 a year in lieu of consultation fees. Private practice not permitted. Free unfurnished quarters or an allowance of £100 a year in lieu. Generous home leave. Free passages on appointment for Officer, wife, and children under 18 years, not exceeding 5 persons in all. Assisted passages for Officer and wife on leave.

Application forms from Director of Recruitment, Colonial Office, London, S.W.1 (reference No. BCD. 117/30/019).

LAGOS TOWN COUNCIL, Nigeria. Assistant Maternity AND CHILD WELFARE OFFICER required on contract for 5 years in first instance. Salary scale (including inducement allowance) £1170 rising to £2118 a year, plus staff pay £100 a year. Commencing salary according to qualifications and experience. Free passages for Officer and wife. Assistance towards cost of children's passages and grant up to £150 annually towards maintenance in United Kingdom. Liberal leave on full salary after each tour of 12–24 months. Outfit allowance up to £60. Candidates must be registered medical practitioners and should preferably have postgraduate experience and/or training in obstetrics.

Write to the Crown Agents, 4, Millbank, London, S.W.1. State age, name in block letters, full qualifications and experience, and quote M3/43058/LD.

NAVY, ARMY AND AIR FORCE INSTITUTES. Applications are invited from general practitioners in the undernoted towns for the appointment, in a part-time capacity as MEDICAL OFFICERS to this Corporation. Successful applicants would be required to examine and report on the condition of employees of the Corporation who may be referred to them from time to time. Fees for this work will be paid on a scale agreed with the British Medical Association.

Applications, giving full details of qualifications and experience, should be sent to Principal Medical Officer, Navy, Army and Air Force Institutes, Kennington-lane, London, S.E.11. Applicants should not be more than 60 years of age.

The towns for which applications are invited are :—

Edinburgh.	Aberdeen.
Glasgow.	Perth.
Dundee.	Inverness.

WEST BROMWICH. COUNTY BOROUGH OF WEST BROMWICH. Applications invited from registered medical practitioners for appointment of DEPUTY MEDICAL OFFICER OF HEALTH AND DEPUTY PRINCIPAL SCHOOL MEDICAL OFFICER. Salary scale £1307, by 4 increments of £55 and 1 of £50 to £1577. The Council have adopted conditions of service agreed by the Medical Council of the Whitley Councils for Health Services.

Further particulars and form of application from the undersigned. Closing date for applications 1st October, 1956.

Town Hall, West Bromwich. J. M.-DAY, Town Clerk.

WEST LOTHIAN. COUNTY COUNCIL OF THE COUNTY OF WEST LOTHIAN. Applications are invited for the appointment of ASSISTANT MEDICAL OFFICER OF HEALTH from registered medical practitioners holding the D.P.H. Preference will be given to candidates who have held a house appointment in a maternity hospital. Every opportunity will be given to the successful applicant to obtain experience in all aspects of Local Health Authority work. Salary scale £1050–£50 (3)–£1200–£55 (5)–£1475, with placing according to experience. The post is superannuable. Possession of a car, for which an allowance will be provided, is essential.

Applications, giving full details of age, qualifications and experience, together with the names of 3 referees, to be lodged with the undersigned not later than 15th September, 1956.

JOHN CALDER, County Clerk.

County Buildings, Linlithgow, 23rd August, 1956.

GLAMORGAN EDUCATION AUTHORITY. Borough OF RHONDDA. COMMITTEE FOR EDUCATION. Applications are invited from registered medical practitioners for appointment as ASSISTANT MEDICAL OFFICER, under the supervision of the District School Medical Officer at a salary of £1050–£50–£1200–£55–£1475 p.a. Preference will be given to candidates holding the D.P.H. or D.C.H. and experience in pædiatrics will be an advantage. The appointment is superannuable and the successful candidate will be required to pass an examination as to physical fitness.

Forms of application and conditions of appointment may be obtained from the District School Medical Officer, Tydfil House, Pentre, Rhondda, by whom completed applications should be received as soon as possible. D. J. JONES, Town Clerk.

STATE PUBLIC SERVICE
QUEENSLAND, AUSTRALIA

DIRECTOR OF INDUSTRIAL MEDICINE

Applications are invited from qualified medical practitioners for appointment as Director of Industrial Medicine, Department of Health and Home Affairs, Brisbane, with salary-range minimum £A2706 10s. p.a., maximum £A2956 10s. p.a., inclusive of present basic wage adjustments and subject to any further such adjustments. Salary in excess of the minimum may be paid according to the qualifications and experience of the appointee.

Applicants must be registrable as medical practitioners in Queensland and must have a practical knowledge of general medicine, reasonable experience in clinical practice, and a very definite interest in preventive medicine. The applicant must have a genuine interest in occupational health in both primary and secondary industries in a tropical and sub-tropical environment. Additional qualifications in either general medicine or public health would be an advantage but are not a necessity.

In selection due regard will be paid to personal attributes deemed necessary for industrial practice, as well as to academic qualifications. If a suitable applicant has not specialist knowledge of industrial medicine some facilities would be available for training therein.

Further particulars may be obtained from the Agent-General for Queensland, 409 and 410, Strand, London, W.C.2.

Applications should contain particulars of full name, date and place of birth, marital status, children (if any) and any war service, and full details of qualifications and experience and should be accompanied by references or certified copies of references.

Applications should be forwarded by air-mail so as to reach the Secretary, Public Service Commissioner's Department, Box 488H, G.P.O., Brisbane, Australia, by 1st November, 1956.

SASKATCHEWAN DEPARTMENT OF PUBLIC HEALTH
CANCER CLINIC
UNIVERSITY HOSPITAL
SASKATOON, SASKATCHEWAN, CANADA

SENIOR CANCER CLINIC ASSOCIATE required for the above Clinic.

Salary $828 per month with automatic annual increases to $994 per month.

Requirements—Certification by the Royal College of Physicians and Surgeons of Canada or its equivalent. Applicant should be an Internist and have considerable experience in investigation and diagnosis of cancer cases.

For application forms or further information write Personnel Officer, Provincial Health Building, Saskatchewan Department of Public Health, Regina, Saskatchewan.

THE MEDICAL SERVICE OF THE ROYAL NAVY
VACANCIES FOR MEDICAL OFFICERS

Candidates are invited for Short Service Commissions of 3 years, on termination of which a gratuity of £450 (tax free) is payable. Ample opportunity is granted for transfer to Permanent Commissions on completion of 1 year's total service. Officers so transferred are paid instead a grant of £1500 (taxable).

All entrants are required to be British subjects whose parents are British subjects, to be medically fit, and to pass an interview.

Full particulars from the Admiralty Medical Department, Queen Anne's Mansions, St. James's Park, London, S.W.1.

DIAGNOSTIC RADIOLOGIST

An experienced Diagnostic Radiologist is required for the Department of Health and Public Welfare of the Province of Manitoba. The possession of the D.M.R.D. is essential. Starting salary $10,000 a year, on contract, renewable, and with increments. Car provided. Assisted passage may be arranged if required.

Apply, with full details and the names of 3 referees, to :
THE CIVIL SERVICE COMMISSION,
Legislative Building,
Winnipeg, Canada.

HERTFORDSHIRE COUNTY COUNCIL. Assistant COUNTY MEDICAL OFFICER. Diploma in Public Health or Child Health desirable, but not essential. Salary £1050–£1475. Car necessary. Travelling and subsistence according to national scale.

Application forms and further particulars from County Medical Officer, County Hall, Hertford. Forms to be returned by 22nd September.

General Practice

For an Executive Council post (England and Wales) apply on form E.C.16A obtainable from the council. Mark envelope "Vacancy."

AMERSHAM, BUCKINGHAMSHIRE. Applications invited for Medical Practice (rural) in residential district, death VACANCY. List 2905. Intermediate area. Residence, including surgery premises, available for purchase. Applications on Form E.C.16A to the Clerk, Buckinghamshire Executive Council, Walton House, Walton-street, Aylesbury, Bucks, by first post 19th September, 1956.

HARROGATE. Applications are invited for Vacancy (urban). List at present 1369. Residence and surgery expected to be available for purchase. Apply on Form E.C.16A to the undersigned, from whom further particulars may be obtained, not later than 17th September, 1956.

C. H. STABLER, Clerk of the West Riding Executive Council.
5, St. John's-north, Wakefield.

RUTHIN. Applications are invited for Vacancy (urban and rural) caused by resignation. List approximately 1500. Residence and surgery may be available. Applications on Form E.C.16A to the undermentioned before 22nd September, 1956.

TUDOR WILLIAMS, F.C.I.I.,
Clerk of the Denbighshire and Flintshire Executive Council.
11, Grosvenor-road, Wrexham.

PORT MORESBY (PAPUA AND NEW GUINEA). LOCUM required for 6 months from mid-October with possibility of taking over practice, which includes some midwifery. £150 (sterling) tax-free, and all found, plus half air fare. Interview in London.—Apply with brief particulars: Address, No. 244, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

Miscellaneous

Shell Petroleum Company Limited invites applications from suitably qualified medical practitioners for the post of Medical Officer for general duties. Candidates should be 30–35 years of age, have had at least 4 years experience in hospital appointments, general practice, or with H.M. Forces, and must be willing to serve in the Company's medical establishments both in the U.K. and overseas. Previous industrial or overseas experience is not essential. The salary of the successful applicant will be based on experience and he will be eligible for membership of Pension Fund.

Please write in confidence to : Staff Department (R), Shell Petroleum Company Ltd., 16, Finsbury-circus, London, E.C.2.

Christmas Island, Indian Ocean. Applications are invited for the position of Assistant Medical Officer at Christmas Island, duties to commence January, 1957. Applicants should be British born and have British University degree. Term of engagement 3½ years. Salary £1400 Australian currency p.a. Free board or allowance in lieu thereof. Free housing, partial furnishing. Earnings liable Singapore income-tax which will be refunded. Free passage, full salary on voyage. Intermediate leave of 2 months at end of first 21 months, 3 months at end of contract, but 6 months home leave if re-engaged. Climate healthy, living conditions good. Fully equipped hospital.

Applications in writing, giving full particulars of qualifications and copies of testimonials, to the London Manager, THE BRITISH PHOSPHATE COMMISSIONERS, 2, Grosvenor-gardens, London, S.W.1.

Young Doctor required to accompany construction crews on 200-mile pipe-line job in Pakistan. Must be prepared to rough it. Mobile camp quarters. All found. Very good salary. Tour of duty 9–12 months.—Apply to : D. & C. AND WILLIAM PRESS LTD. (Personnel Department), 20, Albert-embankment, London, S.E.11.

Consultant Physician, approaching retirement from hospital, would like part- or full-time occupation connected with medical editorial or literary work.—Address, No. 242, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

The Proprietor of British Patent No. 692890 for "Improvements in Sanitary Towels" desires to enter into negotiations with a firm or firms for the sale of the patent or for the grant of licences thereunder.—Further particulars may be obtained from : MARKS & CLERK, 57 & 58, Lincoln's Inn-fields, London, W.C.2.

Electrocardiograph, Eimquist Junior, for sale. In excellent condition.—Address, No. 241, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

For sale. Stainless steel modern operation table with all accessories, 1 Oxford vaporiser. £65.—Address, No. 243, THE LANCET Office, 7, Adam-street, Adelphi, London, W.C.2.

"Pregnancy Diagnosis by the Xenopus Method," 24-hour service. Send specimen of urine and £1 1s. fee. Hæmatology, Biochemistry, Flame Photometry.—WELBECK BIOLOGICAL LABORATORIES, 26, Park-crescent, Portland-place, W.1 (MUSeum 5386–7).

Applicants for posts requiring testimonials copied or duplicated should communicate with MANTON SECRETARIAL SERVICE LTD., 98, Victoria-street, S.W.1 (Phone : VICtoria 0141), who are specialists in this kind of work.

Live Leeches always in stock.—Apply: R. Brooks & Co., Lucullus House, 4, Barbican, London, E.C.1.

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ANNOUNCING

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